AMERICAN MACHINIST

A PRACTICAL JOURNAL OF MACHINE CONSTRUCTION

VOLUME 24 NEW YORK AND LONDON NUMBER 18

Published at 218 William St., New York,
Every Thursday by the

American Machinist Press.

[INCORPORATED.]

Also published at 34 Norfolk St., Strand, London, W. C.,
Every Saturday.

Correspondence on mechanical subjects solicited. Name and address must always be given—not necessarily for publication.

Address all business communications to the American Machinist Press. Matter for reading columns may be addressed to the Editor.

Subscribers can have address changed at will. Give old and new addresses. Date on wrapper denotes end of month in which subscription expires.

Subscription Price:

$4 per year, postage prepaid, to any post office in the world. No back numbers beyond current year.
For sale by newsdealers, generally.

Subscription agent for Denmark, Norway and Sweden, V. Lowener, Copenhagen. Subscription agent for Germany, Austria and Holland, Gustav Diechmann & Sohn, Neue Promenade 4, Berlin. Subscription agent for Spain, J. F. Villalta, Puertaferrisa, 7-9 Barcelona.

Entered at New York P. O. as mail matter of the second class.

Cable address, "MACHINIST," N. Y.
Lieber's and A B C Codes.

Friction in Machine Shops.

On every hand there are difficulties in machine shops between employers and employees, difficulties of a nature which a few years ago were unheard of in the machinery business and which most machinery men would then have thought unlikely to ever present themselves. The immediate cause of these troubles is of course the organization of the International Association of Machinists, and most employers are no doubt ready to charge that organization with the whole trouble and to believe that there would have been none had that organization not been formed. There are reasons, however, for looking deeper than this for the ultimate cause, or rather for considering the organization as an effect rather than a cause.

Very profound changes have been taking place in the machinists' business during the past fifteen years. Methods have changed very much within that time. The average production of a worker in a machine shop has been much increased, many outside men have been drawn into the business who now by the improved methods and specialization do work formerly done by regularly trained machinists and, in nearly every branch of the business in which competition is entirely free and unrestrained, much more of metal in the shape of machinery is being sold for a dollar than would have been thought possible a few years ago. In other words, most of the benefit of the reduced cost of machine construction has gone, not to those who build machinery or sell it, but to those who buy it and use it.

It is therefore not so much their employers that the men contend with when they talk of strikes for shorter hours or better pay as it is with conditions that they themselves have helped to create and which will need to be changed or modified somewhat either before or as a result of any changes that affect the cost of production.

When new methods of doing work first begin to be adopted the first few manufacturers that adopt them may make money out of them, because prices do not usually immediately fall as a result of cheapened processes; but those who adopt these improved methods later usually are forced to do so in self-defense to bring their own costs down to a figure that will leave a margin at the lower prices. It is a familiar fact, attested by hundreds of examples, that when a manufacturer will not, or for any reason cannot, adopt these improved methods at all, either early or late, he nearly always goes out of business—always in fact, unless previously acquired capital or some special conditions sustain him.

There can be no manner of doubt but that most, if not quite all, machinery manufacturers would just as lief dispense a portion or all of the gain resulting from improved methods to their employees in the form of higher wages or otherwise as to give it to customers in the way of reduced prices or greatly improved machines at the same price. But when costs are reduced there may be no general demand for increased wages while there is always a very strenuous demand for lower prices of the product—a demand that it often becomes impossible to resist when one's competitors have given in to it.

The ideal thing, perhaps, would be for employers and employees both to be so organized as to control the situation and then to agree that when material reductions of cost take place a portion of the results shall immediately go to employees in increased wages or shorter hours—the rest to go to the employers, to be kept if they can, or given to customers in lower prices if they must.

At page 149, volume for 1900, we gave under the title "A New Form of Trade Union" an account of a joint organization between employers and employees which has worked and is working successfully in England,* and which we believe would enable employers and their men to divide between them such benefits in any proportion as they might choose and to give to buyers of the product only such portions of the results of cheapened processes as might seem advisable for the good of the craft. This form of union has not received the attention here that it deserves. Mr. Halsey's Premium Plan of paying wages, by enabling costs of production to be reduced while at the same time wages are advanced, both taking place automatically—the one as a consequence of the other—is also an important and proven to be practicable means of avoiding difficulties about wages, because it is based upon justice and does away with the necessity for or the temptation to make periodical "readjustments"—*i. e.*, cutting down of piece-work prices.

Until some such plans are adopted we suppose there is no other way for it but to settle things by the cruder and certainly far less satisfactory methods of the strike or the lock-out, but it does seem as though machinists who pride themselves upon their habit of getting over difficulties by the exercise of their brains, by finesse rather than by brute strength could, and eventually would, find or devise a better way.

We believe in high wages and generally good conditions. We believe in the real economy of high wages and good working conditions and believe most employing machinists also believe in these things, at least in the abstract. The great question is how to prevent wages going too low or rather how to secure for the men a fair portion of the results of the improvements that are going on. The situation seems to be somewhat like that which is often developed when there is an effort to secure early closing of stores in a town. No merchant will do it unless his competitors will also do it, and if one or two hold out they block the game. But things of this kind are obviously more difficult to handle where competitors are not in the same town nor even in the same State, but are scattered over the country from Boston to Omaha and beyond.

Another thing seems to be thoroughly demonstrated by both reason and experience, and that is that the machinist, above all others, must recognize that changes are bound to take place and that progress must be made. He makes his living by

*Described by its inventor, E. J. Smith, in the "Forum" for January, 1900.

the greater or less willingness of others to progress—*i. e.*, to do with machinery what was formerly done by hand, or to do with new and improved machinery what was formerly done by older and less efficient machinery. The machinist simply *must* take the medicine he is continually prescribing for and urging others to take. He must be prepared to adopt improvements and to utilize them to the full. Any effort to repress or to retard the march of improvements or to prevent the full use of them will certainly react upon the craft with disastrous results, and such a thing must not be thought of.

As we have said before, we believe we voice the sentiments of nine-tenths of the employing machinists of the country when we say that nine hours a day is long enough for men to be shut up in shops working, and that it would be a good thing all around if the nine-hour day were already adopted and generally in force. But "if wishes were horses beggars might ride": wishing for a thing and bringing it about without friction or possibly disaster are two different things. Above everything else there is needed the disposition to "hear the other side"—to get together and to reason things out, rather than to undertake to fight them out.

The Umpire or the Editor.

Within the past few months the "American Machinist" has received communications from a great many men who have never before written anything for publication, and most of whom very naturally fail to appreciate all the points of such work and the limitations which necessarily hedge about an editor's doings.

The editor of such a journal as this occupies a position quite similar in many ways to that of the umpire of a baseball game. His viewpoint is different from that of any of the players or the spectators; he must decide things from that viewpoint, and must use his own best judgment as to what to do in every case. Moreover, he must usually decide quickly in order that the game may go on, and, having made a decision, must adhere to it unless there is overwhelming evidence that a mistake has been made. Finally, he must expect some of the players (contributors) and some of the spectators (readers) to see some things differently from what he himself sees them and to "put up a stiff kick" once in a while over what seems to them to be a "rank decision." The experienced umpire knows that all this is part of the game—knows that other people have a perfect right to their opinions different from his own, but at the same time also knows that he alone is responsible for correct decisions, and that therefore he alone must make them.

Any editor worthy of the name knows, of course, that he will make mistakes; all he hopes to do is to reduce them to the smallest possible number, hoping that they will be so few that, in spite of them, the paper will be a success.

Presumably no player in the game nor any spectator of it is in a position to arrive at a decision as likely to be right as that of the umpire; he is supposed to be disinterested as between different players and to have specially qualified himself for seeing and understanding what is going on over the entire field. It ought to be much the same with an editor.

The editor of any journal that amounts to anything and is in a healthy condition finds on his desk much more material than he can possibly use in the paper. He must select from it that which in his judgment will best suit the greatest number of his readers; taking care to so balance things as to avoid leaving any considerable number of them, though a minority, with nothing appealing to their special interest. The work of sorting out and preparing material for publication is very exacting, and a very great deal of work must be done in connection with it which does not appear or show in the finished product. Of course this work cannot all be done by one person, and is subject to the occasional inconsistencies that inevitably result from the fact that no two men, even when guided by the same general principles, will always work things out precisely alike.

The new contributor is more likely than the older one to think that *his* article, at any rate, should find a place in the paper right away, and if it does not, he sometimes concludes that no articles from him are wanted; in spite of the fact that all men are subject to individual influences that make their literary work more or less uneven and that make the best writers occasionally produce things of little or no value. Some of our contributors who seem to feel badly because we decline certain articles of theirs might feel comforted if they could know how often it happens that matter prepared here in the office for publication is finally either much modified or consigned to the waste basket.

It is quite a common thing for the newer contributors to expect to see their contributions in the number of the paper that reaches them first after they have mailed the material to us, not knowing, of course, that this is usually an utter impossibility. Then when it does not appear as soon as they think it should, some of them write and ask the reason. It is simply impossible for us to answer such letters. We can usually tell nothing about a given piece of manuscript between the time of its appearance in the office and its appearance in the paper or final rejection. It may be in the hands of anyone of a half a dozen different men; what to do with it may not yet have been decided upon, and the search for it by from one to three, six or more persons would involve waste of time that must be devoted to getting it and other manuscripts "through the mill."

Some players abuse the umpire, but there are no fines for this in newspaper work; the abuse is simply disregarded and we try not to be influenced against a good contribution because the author of it is abusive.

Contributors, however, are very light sinners in this respect compared to a few unreasonable manufacturers or their advertising managers, who think that the signing of an advertising contract ought to give them a right to more or less "write ups" and descriptions of their tools whether new and interesting or not and regardless of whether or not they themselves are willing to give us the information necessary to permit an intelligible description to be written, and who threaten to withdraw their advertising patronage if we do not publish matter in which they are interested in the manner and upon the date specified by themselves. Some have carried out their threats, apparently not being able to see that if we ran the paper upon the principle of acceding to every wish of an advertiser the paper would very soon be utterly worthless to both readers and advertisers. The woods are full of papers that are run upon that principle. They have no readers to speak of and serve advertisers only in helping them to get rid of their money.

The Latest Liquid Air Scheme.

One of the most absurd propositions that have ever come to our notice was made recently, apparently in good faith and in all seriousness, in the editorial columns of the New York "Times." If it had been put forth by a professional joker, it would have ranked among the most brilliant of his achievements. In the work on the Rapid Transit Subway in this city there is much cutting of solid rock to be done, and complaints are frequent and loud about the damage done by the blasting. In the article referred to, it is proposed to cure all that. Let the rock drills do their work just about as at present, but let us have no more dynamite. Just turn a jet of steam into the hole and let it flow there long enough to get the rock as hot as possible, and when the rock can't be made any hotter fill the hole, and keep it filled for a while, with liquid air. The sudden cooling of the rock will of course crack it, and there you are.

One of the simplest schemes ever devised. A few of the most obvious objections to it are that it would take ten years to build sufficient air-compressing plants, the liquid air would cost a hundred times as much as dynamite, you can't by any possibility fill the hole with it, as it would boil out faster than you could get it in, and it wouldn't crack the rock, anyway.

The scheme, however, as a financial proposition, is a promising one. Let a

company be organized for working it, and there can be little doubt that an able promoter would be able to make more than a living out of it for a considerable time. Liquid air has been quiet of late, and this should give it a boom again.

Legal Notes.

BY WM. MARSTON SEABURY, LL.B.

WHERE A DOG WAS MISSING FROM COG WHEELS OF A CRANE.

Petro Dzinbienski had been employed by the Mott Iron Works as a molder eight years, when it became necessary for him to take the place of another molder's helper, who had left the company's employ. While operating a crane used for hoisting and moving flasks one of his fingers was caught in the cog wheels and cut off. It appeared that the dog which dropped into the cogs had been missing for at least a year, and the only means of supplying its place was to insert an iron spike or other piece of iron in the cog wheels. Dzinbienski had never seen this machine operated before, and was not aware of its defect, and in endeavoring to obey the molder's instructions to stop it, "and put something in there—a piece of iron or nail—and stop," his finger was caught.

Upon suing the company for damages, a Justice of the Supreme Court in New York County dismissed his complaint, on the ground that his own negligence contributed to the accident. Dzinbienski appealed to the Appellate Division of the Supreme Court, and in reversing the judgment and ordering a new trial, Mr. Justice Hatch said, "The defendant owed to its servant the duty of providing a place and a machine reasonably safe for the work which he was directed to perform. The machine which the plaintiff was called upon to use was clearly defective and unsafe, and it was for the jury to determine whether the master had adopted all reasonable precaution to shield him from the danger he was exposed to in the use of the crane, before requiring him to operate the same. Nor should it be said, as a matter of law, that the danger was so obvious that the plaintiff was chargeable with the risk. He had had no experience in the use of this machine, nor was he informed that it was in any way defective. His attention could not have been directed to the defect, except by use of the machine or by having his attention particularly called to it by the master or the fellow workman. He was not bound to examine the derrick to see if it was defective, but was justified in assuming that it was in good condition." (101 St. Rep. 256.)

Mint Apprentices and Draftsmen Wanted.

The United States Civil Service Commission, Washington, D. C., announces that more eligibles for apprentice in the Mint and Assay service are desired. They must be graduates in metallurgy, mechanical engineering or chemistry from schools of recognized standing and must be between 18 and 24 years old.

The United States Civil Service Commission also announces that May 21 an examination will be held in any city in the United States that has postal free delivery for draftsman in the Division of Publications, Department of Agriculture, at $720 a year, or other similar positions as they occur. The examination will consist of map, landscape, colored and mechanical drawing. Persons who desire to compete should at once apply to the Commission for application forms 304 and 375.

The Municipal Civil Service Commission, New York, will hold an examination for draftsman on bridge construction May 17, at 10 A. M., in the office of the Commission, 346 Broadway. The subjects will be technical knowledge, experience, handwriting and mathematics. The technical paper will be mainly devoted to structural bridge work and designing. Candidates should provide their own drawing boards and instruments. Applications may be obtained from Lee Phillips, secretary, and further information with reference to the examination from F. G. Ireland, Chief Examiner.

Commercial Review.

NEW YORK, Monday, April 29.

THE MACHINERY MARKET.

A matter to which is due some consideration just now is the influence upon American export trade from the German industrial depression in other lines than machine tools and in other markets than the German Empire. It is reasonable to suppose from the well-known set-back of the German electrical manufacturers that they will be disposed to put up a pretty sharp competition to float their goods on the world's markets, and such is proving to be the case. An inquiry relative to this matter made at the office of a direct-current apparatus company which has agents in several parts of the world brings out that the subject has been forcibly thrust on their attention. This company is advised by its German representative that it is impossible to meet the prices there being made. The company's South American trade also is suffering a marked decrease, for which the successful unloading of German goods on that market seems to be responsible.

A more hopeful view of the matter is taken at the office of the Bullock Electric Manufacturing Company. Here it was stated that some German apparatus of a small or ordinary character had been bought in England because the American was not so readily available, but that the latter was preferred. The speaker reasoned that American electrical machinery is not likely to suffer much from the German among European buyers, because these consider the quality of the stuff very carefully when they import it from abroad and will not take the risks that might be assumed in domestic trade where there is a little advantage in price. Moreover, it was held—and this by a comparison made on the spot with the catalog of a representative German builder—that German prices and American are about on a par and that the orders will go where the quality is—viz., on the side of the American. Electrical machinery, it was contended, requires a higher order of expertness to construct than do some other kinds and that industry is not a subject for the price cutting that might be possible in other lines.

Ups and downs mingle in the experiences of the local electrical machinery offices from which reports have been received. One company represented in town booked during March the heaviest month's trade in its history, though April has not turned out so well. The agency for another company expects to double last year's sales this year. It may also be said that nothing but the broadest and most unequivocal evidence of a quietness in demand could offset the buoyancy of the general industry calling for electrical plant which is continually evidenced in very many ways—for instance, in the activity of the engine market as shown in one of our reports during the present month.

The outlook is reported very bright by Pawling & Harnischfeger, manufacturers of traveling cranes at Milwaukee, Wis. Inquiries are numerous and indicate the future receipt of much business. The company sends us a list of recent sales of its cranes and we notice that among the buyers is a large proportion of steel works. Some of the concerns named are the American Sheet Steel Company, American Clay Working Machinery Company, Nordberg Manufacturing Company, Chandler & Taylor Company, and the Oesterreichisch-Alpine Montangesellschaft, Vienna, Austria.

The development of American shipyards which has been so notable in the last two or three years is exemplified by recent news that the William R. Trigg Shipbuilding Company, of Richmond, Va., is expected to be greatly enlarged, a meeting of stockholders to increase the capital stock $1,500,000 being set for to-day (April 29). The improvements call for the erection of several new buildings, the introduction of new machinery and a general overhauling of the plant.

FOREIGN TRADE NOTES.

The ardor of those interested in the sale of American tools on the Continent still exists and a decision has been reached to establish a new depot in Germany or Austria for the exhibition and sale of American machine tools and other machinery. Full particulars are to be had from the American Machinery and Export

Company, 15 Cortlandt street, New York city.

Consul-General Guenther has reported from Frankfort, Germany, that action has been taken at a meeting largely attended by members of technical and other societies recommending the establishment of a permanent exposition of machinery and models in that city and calling on the proper authorities and general public for aid. How much consideration American machinery would receive at this show is not stated.

An exposition is to open in Hanoï, Tongking, November 3, 1902, to be participated in by France and her colonies, by Indo-China and the Far Eastern countries.

The erection of a new shell factory in Ichapur, India, by the authorities and the disposal of that in Cossipur is said to be in contemplation.

During the past three years there has been a steady increase in the importation into Egypt of machinery, locomotives forming perhaps the largest item. Egypt is rapidly being developed. Pumping machinery is now being wanted in that country, the approximate value imported in 1900 being $32,000, as contrasted with half that sum in 1898. There is also a good demand now for threshing and grain-cleaning machinery.

The manufacture of wool in Mexico, begun some ten years ago, is now assuming good proportions. The looms in the various mills are driven by steam and are of improved English and American types. The fuel used is wood or coal. A proposal has been made to employ electricity as a motive power to be transmitted from a central station. The industry is now so prosperous that several firms have ordered new machinery.

Up to the present the bulk of the machinery used in the Mexican sugar industry has been supplied from Scotland and France, but during the last two or three years the United States have sent a quantity, the proportions being as follows: England and Scotland, $720,000; France, $300,000; United States, $225,000. The machinery consists of triple pressure cane mills, vacuum pans, etc. We may add that all machinery and apparatus for agricultural purposes enters Mexico duty free.

In Spain there is an opening for machinery for dealing with cork. Up to recent date hand labor has been chiefly used, but lately there has been a call for machinery in certain markets. The demand for planing, strip-cutting, chopping and other machines is steadily increasing. Whereas cork-planing machines can be driven by hand, for the other machines small motors are required. The motors hitherto used have been supplied by British and German makers, while France has the bulk of the trade in planing machines (Nové's system) and also the knives accompanying same. The German knives are not liked and have but a small sale, not being good enough for the work.

Makers of petroleum engines for irrigation purposes would find a likely market in Turkey, particularly in Beirout, to which city inquiries should be directed. The sort wanted are from 1 to 5 horse-power, and makers should state the cost of operating the engine and quantity of oil consumed per working day of 12 hours. The Germans have done quite a business in this direction, especially in the adjacent city of Haifa. Belgium is making great efforts to push the sale of oil engines among the small Turkish millers. In mechanism these engines are very simple, but the parts are strong and they can easily be taken to pieces by anyone; they also have the common lamp oil, which is very cheap in Turkey. Their price is very low and they are economical in running. An engine of 3 horse-power requires only 500 grammes of petroleum per horse-power hour. Each of these engines is accompanied by a guarantee as to the power promised and the quantity of oil consumed.

The discovery of immense peat deposits in Russia has led to inquiries for special machinery to utilize this as fuel. The Russian Government has already recognized the importance of the discovery and appointed a commission to report on the matter. The preliminary statement of that body is, among other things, to the effect that financial aid should be granted by the government for the purchase of necessary machinery for the construction of the narrow-gage railroads, etc.

CHICAGO MACHINERY MARKET.

The Lake Shore Railway Company will open to-day (Saturday, April 27) bids for the generators for their new shops at Collinwood, near Cleveland, Ohio. They specify two generators of 400 kilowatts each and one of 75 kilowatts. As deliveries will not be wanted before next February, it is surmised there will be no great hurry in making the award. Bids have not yet been asked for the motors, but they will follow as a matter of course. Generators of the size mentioned, it is stated, can now be furnished in from three to four months' time. Several other Western railway systems are considering the electrical equipment of their shops, but have not yet come into the market.

The Dodge Manufacturing Company, of Mishawaka, Ind., purchased this week an electrical equipment consisting of one 150 and one 75 horse-power generator with a corresponding complement of motors from the Northern Electrical Manufacturing Company. J. W. Peterson, the newly appointed Chicago representative of the Northern Electrical Manufacturing Company, says inquiries are very numerous.

The present demand perhaps runs more largely to small work than to large orders. It is a common report that while few big electric equipment orders have been placed within the past few weeks, there has been a multitude of small orders, the aggregate making more than the ordinary business, even for this season of the year. And in this respect Chicago trade has shown a more marked improvement, as compared with a year ago, than the outside trade, mainly because of the strike features of business in the spring of 1900.

The Gregory Electric Company are doing the best business in their history. For three weeks in April the total was equal to the entire month of April, 1900, and trade has been running just about that way for several months past, from 30 to 35 per cent. ahead of last year. They are installing some lighting plants, but the business is mainly shop and factory work.

The Gueder & Paeschke Company, Milwaukee, have purchased an additional lot of fifteen motors from the Sprague Electric Company and now have in operation about fifty motors. The Sprague Company have lately sold equipments to many printing companies, including the Robert O. Law Company, the Eagle Lithographing Company and O. L. Deming, all of Chicago.

The C., B. & Q. road has purchased from the Crocker-Wheeler Company additional motors for their Hannibal (Mo.) shops and now have in operation there eighty-three motors aggregating about 750 horse-power.

Quotations.

NEW YORK, Monday, April 29.

Pennsylvania Foundry Pig Irons, Jersey City delivery, good brands:

No. 1 X	$16 00 @ 16 50
No. 2 X	15 25 @ 16 00
No. 2 plain	14 65 @ 15 25
Gray forge	14 40 @ 14 75

Alabama Pig, New York delivery:

No. 1 foundry, or soft	16 00
No. 2 foundry, or soft	15 50
No. 3 foundry	15 00
Foundry Forge, or No. 4	14 75

Bar Iron—Base sizes—Refined brands, mill prices on dock 1.55 @ 1.65c.; from store, 1.80 @ 1.90c.

Tool Steel—Base sizes—Good standard quality, 7c.; extra grades, 10c. and upward.

Machinery Steel — Base sizes — From store, 1.90 @ 2.00c.

Cold Rolled Steel Shafting—Base sizes —From store, 2½ @ 2¾c.

Copper—Lake Superior ingot, 17c.; electrolytic and casting, 16⅝c.

Pig Tin—25⅝ @ 26c., for 5 and 10-ton lots, f. o. b.

Lead—For wholesale lots, 4⅜c., with .02½c. extra for carloads.

Spelter—4.05c., New York.

Antimony—Cookson's, wholesale 10⅜c.; Hallett's, 8¾c.; Hungarian, Italian and Japanese, 8⅝ @ 8¾c.

Lard Oil—Prime City in jobbing lots, 69 @ 70c.

Bust of James Watt, in the Front of the Straight-Line Engine Company's Works.

When the works of the Straight-Line Engine Company were built in 1889 and 1890, the original engine, built in 1872 was mounted on the center in front, and a niche was built in below it with the intention of putting therein the bust of James Watt, which intention was recently carried out, as shown by the half-tone above, which is a view of a portion of the front of the building.

The bust is white terra-cotta, was modeled expressly for this place by the monumental artists, Roddis & Nourse, of Birmingham, England. It will be remembered that James Watt's works and residence were in Handsworth and Soho, suburbs of Birmingham, and that he was buried in Handsworth Old Church, where a seated statue in white marble has been erected over his grave. The bust above referred to was presumably modeled from this statue, and is probably the only bust of Watt in this country and one of the few art embellishments of this character ever added to a machine shop.

It will be noticed that, architecturally, the whole design of the works differs widely from ordinary work, depending wholly on a balanced grouping of openings and not on elaborate cornices, pilasters, paneling or decoration.

The photograph shows also the famous inscription over the door which has been

BUST OF JAMES WATT.

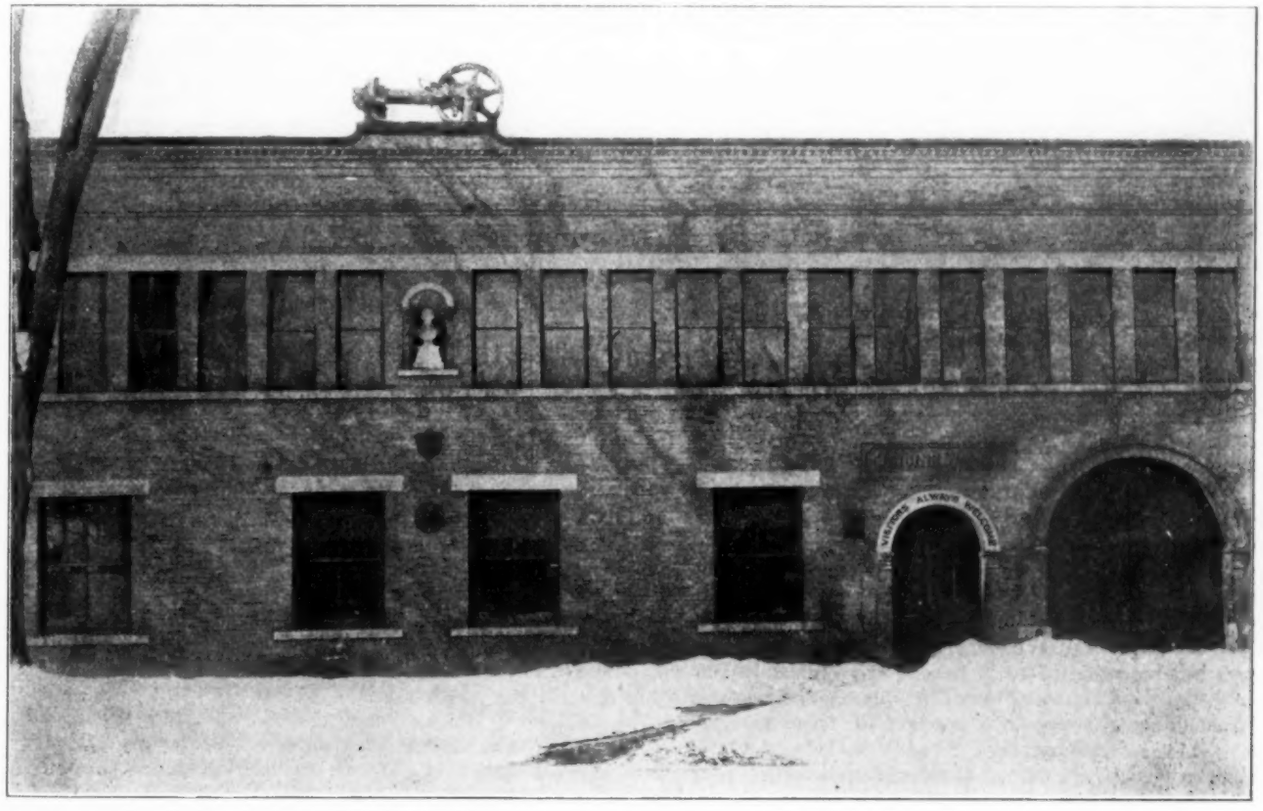
quoted and referred to all over the world where shop and industrial matters are discussed.

Echoes From the Oil Country.

BOYS AND THE TRADE.

It seems sometimes as if all the boys for miles and miles around here were being consumed by a burning desire to learn the machinist's trade, and that for some reason they had the idea that our shop with its old machinery, old buildings and general appearance of dirt and distress was the one place in all the world where it could be learned properly; and so I am visited by boys of all kinds, young and old, big and little, smart and dumb, ambitious and lazy, and asked to give them an opportunity to learn. Sometimes the boys have as auxiliary forces fathers, mothers, aunts, uncles, brothers, occasionally sisters and interested acquaintances in general, who endeavor to help things along in various ways.

I find on inquiry that most of those boys want to get into the shop because they think it an easy place to earn a living and have very little taste or idea of mechanics. One bright young man came to me one day and said he had left school and wanted to go at something and wished I would tell him what I thought of the chances of his getting up in the world as a machinist. As he appeared to be an intelligent young man who really wanted information, I took time to have quite a talk with him. He did not claim to be a genius, had never had any particular leaning toward mechanical matters more than in other directions, but was bright, said he was not afraid of hard work, had a good common-school education, and appeared to be in good health. There were several things about him that gave a good impression. He was modest without being bashful. His manners were quiet and respectful, and still spoke of self-confidence,



VIEW OF PORTION OF THE SHOPS OF THE STRAIGHT LINE ENGINE COMPANY.

and he evidently knew he had to give a return for whatever he received.

As to his chances to work up as a machinist compared with what they might be in other trades or callings, I was not in a position to say; but as to whether there were any chances in this trade, I told him that I did not believe that there ever was a man or a boy that learned the trade but that had more chances to get up than he took advantage of. Sometimes he did not see them, but they saw him, and passed by on the other side. Sometimes he saw them, but was not qualified to take them; and sometimes his bad qualities were such that they prevented his getting an opportunity to try.

As this, like my other writings, is for the boys and younger men, I hope the older ones will try to read the meaning more than the mode of expression. If it sets some of the boys to using their eyes and wits it is a success. Some day that young man will be running a shop, or I miss my guess.

One day a young fellow came slouching into the office, leaned against the desk, spat some tobacco juice on the floor, rubbed it in with his foot and opened up with: "Say, boss, gimme a job; I want to go to work to learn the trade." "Which trade do you wish to learn?" I inquired. "Hunh," he grunted. (That sound is hard to write, but you know the kind of a sound that a lazy, uneducated person makes when he does not understand what is said to him.) I repeated my question. "How many have you here?" he asked. "Well, we have blacksmithing, molding and machinist, with boilermaking and patternmaking on the side and a chance to do drafting, and bossing, if the right fellow comes along," I replied.

"Which pays the best?" he asked, as he shifted on to the other foot and took a fresh chew of tobacco.

"That depends so much on the man that has the trade that it is hard to tell. There is not much difference until you get up near the top, and I judge your lack of education would keep you back at first," said I. "How far along did you get in school?"

"I didn't go to school much; we never had a decent teacher, and she didn't like me anyhow, and I only got in the first reader. I don't want to be the kind of fellow that's got to git a lot of books. I want to learn the trade that fellow has." And he pointed out to where one of the boys sat on a box drumming with his heels and whistling. That seemed to take his fancy.

On further inquiry I found that he had never worked when he could help it, and was looking for a chance to keep from doing anything that required exertion of any kind; so I told him the references or recommendations he brought were not suitable, and so I could not take him on. He did not know that he had brought any and said I must be mistaken. I pointed to the mud from his boots, to the tobacco juice, called his attention to his slovenly way of standing and talking, and told him those were the very strongest evidences of what kind of a mechanic he would make. He would be the kind of a fellow that would hang around the saloons and street corners and curse the trade and say "a machinist has no show." The only figuring he would ever do would be to see how little work he could do and how poorly he could do it without being kicked out of the shop.

He would be like one chap I heard of. The boss gave him a job to do and he was stuck until another man took it off his hands and did it. The boss tried to wake him up a little by calling him down for not knowing as much as the other fellow. "Well, he ought to know more than I do, he gets higher wages."

"Did you ever think, you lunk-head, that he got higher wages because he knew?" He evidently never did.

A man came asking for a raise in wages one day, and was told that he was getting all his work was worth. He said the other fellow was getting more, and he was told the other fellow was worth more, as he was doing more and better work. This he acknowledged, but he said he would do more, also, if he was paid more. He also was trying to get the cart before the horse, at least for our shop, and he didn't get his raise.

A good many of the fellows that were boys with me have bossing jobs now; but I don't know of a grumbler or a fellow hunting a soft snap among them, while the old fellow that used to tell me I was a fool for buying tools and books, and that the trade was going to the dogs, and that by the time I had my time served a machinist couldn't get as much as a good laborer, has called around since I came here and wanted a job.

The fellows that got the fine points of the trade in barrooms and tried to climb up by pulling others down are still unappreciated, and they still tell of what a lot of dunces the bosses all are and how they would be digging outside but for the valuable information they absorbed by having a few good all around men in the shop, etc.

There are chances in all directions if you could only see them, and when you get really interested in the trade you will be where some of them are likely to strike you unawares. Bill does the rod work and has good pay and is rather looked up to. Could you do his work if you had a chance? Did you ever think how a rod should be and why it should be that way? Would you like to draw the pay of the superintendent? Sure. Learn to think. That's what he is paid for. And don't you dream for a minute that you can't get tired that way, or that it isn't hard work.

The difference in men, as to value to others, is largely from the ears up. The man that carries the most power there is the one that is in demand in his class. Aim high, but don't be foolish. If your armament is only a muzzle-loading shotgun, don't go after grizzly bears, but try to get as many birds as anyone else with a shotgun not much better than yours. If your business is digging ditches, use your talents to dig a good one before you go to criticising the boss who is running the job, and you are more apt to some day be boss yourself. Don't be afraid to think about your work, and don't waste your time over something so far away that you never get near it, until there is nothing more for you to learn about what is at hand.

W. Osborne.

Mutual Benefit Associations for Machinists.

About the close of the last year we received a letter from a manufacturing concern requesting information concerning mutual benefit associations for invalided workmen. With the idea that such information would prove of interest and profit to many besides the inquirer, we published a note requesting data concerning such associations as had been working successfully for a considerable time. As a result, several letters, with copies of constitutions, of by-laws, etc., are before us. They come from readers who have had experience with such societies among employees in a tool manufacturing, a loom manufacturing, a locomotive building and two railroad shops.

From these five illustrative cases the following general outline of the organization of such societies may be drawn. They are associations formed, officered and managed by the employees of a particular company to support a fund out of which to pay a definite weekly sum for a limited time to members who are laid up from work through injury, or through illness not due to their intemperance or immorality. This benefit averages at the rate of about $1 a day, is generally exclusive of the first week of illness, is limited to about three months continuously, and is often supplemented by a death indemnity—of some $50. The members are regularly assessed a few cents a week, besides which there are nominal initiation fees and special assessments, either on account of deaths or unusual deficiencies in the fund. The officers who have laborious duties to perform are allowed some remuneration, but the object of the association is economically to meet its current obligations to its beneficiaries, and at the end of the year a surplus remaining above a certain amount is in some cases divided among the members. Membership ceases upon leaving the shops in which the association exists.

Let us take for more careful analysis

one of the most important of these societies, the

BROWN & SHARPE MUTUAL RELIEF ASSOCIATION,

Providence, R. I., which was organized September 10, 1886, and has consequently been in operation for more than fourteen years. The society now numbers 900 members, and is in a prosperous condition. As the constitution shows, this society holds a regular meeting annually, twenty members constituting a quorum. It has a president, vice-president, secretary, treasurer, and eight or more directors, elected each year. Among the president's duties are to call special meetings at the request of a majority of the directors or written request of eleven members; to sign with these directors all orders on the treasurer for money, and to appoint committees to visit sick members and make reports to him. The directors have general supervision of the affairs of the association and the responsibility of deciding who are entitled to benefits. Acting with the president, they have power to levy extra assessments, but of not more than 50 cents from first-class and 25 cents from second-class members, nor more than twice yearly, except by consent of two-thirds of the members present at a meeting of the association. The first-class members referred to are those Brown & Sharpe employees whose wages amount to $8 a week or more, while the second-class are those who receive less. First-class members pay an admission fee of 50 cents and weekly dues of 5 cents, and are entitled to $1 per day of sickness (Sundays excepted). Those of the second class pay and receive just one-half of these respective sums. Benefit payments begin at the end of the first week, and run for thirteen weeks only. If notice of illness be not given to the secretary within the first week, the benefits will not begin to run till the expiration of a week from the notice. If a member who has returned to work is taken sick again in less than four weeks, he is regularly entitled to benefits only for thirteen weeks, less the time during which he previously received them. If he has drawn for the full thirteen weeks, he must have been back at work four weeks before he can claim anything more. A new member must have belonged four weeks before he is entitled to any benefits. A physician's certificate of illness may be required by the directors. No benefits will be paid for any sickness or disability from intemperance or any immoral act on the part of the member. This is a usual provision among such associations.

Since the formation of this society, it has paid out for sick benefits $18,247.65. The treasurer's report for three months ending January 1, 1901, shows:

Balance on hand Oct. 1, 1900..	$567.83
Receipts from assessments.....	498.77
Receipts from admission fees....	20.50
	$1,087.10

In these three months has been paid for sick benefits $653 in sums ranging from $2.00 to $78.00, to 34 out of the 900 members. During the life of the society the regular assessments have sufficed to meet the outgo, except on rare occasions of excessive sickness, when extra ones have been levied.

MASON MACHINE WORKS.

Another similar society organized in a New England shop is the Mechanics' Mutual Relief Asociation No. 1, of Taunton, Mass., which exists in the textile machinery manufactory above named. A copy of the by-laws has been sent to us by Wm. J. McGhee. There are the usual officers and thirteen directors. The benefits allowed are $8 weekly for eight weeks and nothing more for four months, and then not unless one has resumed work for two months, unless by two-thirds vote of the directors. A payment of $50 is also made to the legal representatives of a member upon his death. The costs of membership are 50 cents admission fee and 50 cents monthly dues, beside death assessments. The directors may also levy special assessments in case of need. Various penalties are provided, such as forfeiture of all claim to benefits if two weeks in arrears when taken sick. The president, vice-president and secretary constitute the visiting committee. Fifteen members suffice for a quorum at a meeting. The secretary is allowed $2.00 and the treasurer $1.00 per month for his services. At the end of each year a dividend of the funds in the treasury in excess of $100 may be declared, to be paid in the manner the directors determine. As in the first case considered, no benefits are allowed for the first week of sickness. This association apparently makes no distinction as to the cause of the illness for which benefits are asked, but it exercises discrimination in the admission of its members. It will receive no one who has any disability or infirmity liable to unfit him for attending work, or who is over 62 years old, or who is in the habit of using intoxicating liquors to excess.

THE MUTUAL BENEFIT SOCIETY OF THE PERE MARQUETTE RAILWAY

Employees of the Mechanical Department, at Muskegon, Mich., is one of the associations which, like the Brown & Sharpe, provides for different classes of members. To Class A are eligible those earning $2.25 or more a day; to Class B, those earning $1.25 or more, and to Class C, those earning less. A member of Class A is assessed 75 cents a month and is entitled to a weekly benefit or "indemnity" of $9 until $54 is paid, after which he receives $6 per week, but cannot draw in all more than $102 in twelve consecutive months. The figures applicable to Class B are in each case above mentioned two-thirds, and for Class C one-third those for Class A.

For the first week one-half the regular indemnity is allowed. A payment of $25 is made to the heirs of a deceased member of six months' standing. A member returning to work after illness can draw no further indemnity for two weeks. A man 15 days in arrears is not in good standing and if taken sick or injured will not receive benefits until he has paid his next assessment. The rules of this association governing admission of members and payment of indemnities are strict. An applicant for admission must be of good character and in good health. Known intemperance will constitute a bar to benefits at the time being. A member who assumes to be sick, yet who is known to be outside of his lodgings later than 9:30 P. M. forfeits his benefits for one week, and, upon a second offence, for the remainder of his illness. There is a by-law that "any members called on by the board of directors to assist a sick member are required to do so or be fined 50 cents for each refusal, unless a satisfactory excuse can be given." Moneys of the society are required to be deposited in a local savings bank, and no checks of the society to be honored unless signed by the president, secretary and treasurer. At the end of the year, a surplus above $75 in the treasury is divided among the members in proportion to the amount they have paid in during the year, less indemnities received during the year.

A correspondent, W. O. P., who has sent us information concerning this Pere Marquette Railway Association and who was a member for six years, is enthusiastic in its praise. He sends us two association blanks, one a notice of disability and the other a receipt for assessments or fines, which we reproduce. The Chicago & West Michigan, it should be explained, is the old name of the Pere Marquette Railway.

D. & H. C. CO., ONEONTA, N. Y.

An association organized on a simpler plan than the last is the Mutual Benefit Association of the Employees of the Delaware & Hudson Canal Company, at its railroad shops in Oneonta, N. Y., of which we have learned from our contributor, William Newton. Its management rests upon five trustees, elected semi-annually, two from the car shop and one each from the machine, blacksmith and boiler or paint shops. These trustees elect their officers. There is no attempt to keep a surplus on hand, but each payday a notice is posted calling for an assessment enough to cover the expenses of the past month. The constitution places the time to call for assessments in the discretion of the trustees. Relief assessments are not to be less than 25 cents from each member, while in case of the death of one of them a special levy of $1.00 each is made, or of 50 cents on the death of a member's wife. The initiation fee is 25 cents. Some of the rules governing the payment of ben-

efits are as follows: "No member of this association shall receive benefits of relief for the first week of disability; but after having been sick or disabled for more than one week, he shall receive such sum as the association may agree upon for one week's benefit, and in no case shall the amount so paid be greater than five dollars per week or fraction thereof, nor shall the relief extend to a longer period than thirteen weeks for any member, unless ordered by a two-thirds vote of all the members present. . . . Any member receiving benefit for chronic or incurable disease shall not receive benefits for said incurable disease for a longer period than thirteen weeks."

NOTICE OF DISABILITY.

To the Secretary of The Mutual Benefit Society of the Pere Marquette Railway Employees of Muskegon:

THIS IS TO CERTIFY that I,.....

residing at No.....Street, am

confined by.....

.....

Dated this.....day of.....19..

LIMA LOCOMOTIVE WORKS.

The last example before us is the association existing at the locomotive building shop in Lima, Ohio, the organization of which, together with the lessons that have been learned from its ten years of life, are best told in the words of its secretary, Torrey Kirk:

"All employees are eligible to membership. There is no compulsory membership, and the firm have nothing whatever to do with the association. The secretary is really the only paid officer, as he attends to all collections, etc. The treasurer is allowed a remittance of his dues, and the trustees are allowed $1.00 a year. It is managed as economically as can be possible, and has been a great benefit to many families.

"The entrance fee is 25 cents and the dues are 25 cents monthly, to be paid on or before the 10th of each month. Originally all lost time was paid for—that is, from the day a man was invalided—but it was found that some unprincipled men imposed on the society, and that by-law was changed so that the first week's sickness was not paid for. Four dollars a week was allowed for the first ten weeks, and two dollars a week for the next ten weeks; this was to be paid for illness or accident. The membership has varied at times from about 50 or 60 up to 120. The

COUNTERSIGNED BY.....
Treasurer.

No.....

RECEIPT FOR ASSESSMENTS OR FINES.

THIS RECEIPT when countersigned by the Treasurer shall certify that.....

has paid.....Dollars

for dues from.....to.....in

THE MUTUAL BENEFIT SOCIETY of the C. & W. M. R'y Employees, and is entitled to all the benefits as set forth in its constitution and by-laws.

.....Secretary

NOTICE—Notify the Secretary in writing, when sick or injured, also when returning to work. Regular Meeting on third Wednesday of each month.

"The Lima Locomotive Works' Employees' Benefit Association was organized in May, 1891. The original intention in organizing the society was to put a stop to the pernicious practice of raising a collection for the relief of sick or disabled men, or to use the common phrase, 'passing around the hat,' every week or so, as it was thought that a more honorable method could be adopted. There are a president, vice-president, treasurer, secretary and three trustees, who are elected semi-annually, at which time the books are audited. association has paid out through the treasurer, by action of the trustees, from June, 1891, to January 1, 1901, as follows:

"Accident and sick benefits.....$2,170.00
"Three deaths, each $30.00..... 90.00

"Total amount.....$2,197.00

"A physician's certificate must be furnished if so required by the trustees.

"It will be seen by the foregoing statements that if any great number of employees associated themselves in a similar organization they could have 'money to burn.' A few words might be given on what we have found to be weak points, some of which have been remedied, but some have not:

"(1) Have honest and scrutinizing officers.

"(2) Pay claims promptly; exact dues promptly.

"(3) Rascality is not confined to the moneyed classes; there are a few dishonest workingmen, therefore watch all claims.

"(4) Don't put too much confidence in a physician's certificate. He wants his fee for service from the sick man.

"(5) When a man ceases to be an employee, he should cease to be a beneficiary."

The several cases presented offer some points of difference, but it will be seen that for the most part they are organized along parallel lines, which will serve for the guidance of such as have in view the formation of similar societies. To appearance, the Brown & Sharpe association affords the greatest amount of benefit per week to disabled members compared with the regular weekly assessment, the latter being only 8-10 of 1 per cent. of the former. This society has a large membership, and evidently operates under ideal conditions. The figures, however, do not prove the others to be less economical. Nothing is lost by levying large assessments, provided the balance is judiciously invested and inures to the benefit of the members, thus taking the form of an endowment fund. But this is a departure from the sick-benefit idea in its simplicity. One point on which there ought to be no mistake is that in a small society the benefits are no smaller nor the burdens heavier than in a large one, except that the drafts on the treasury are likely to be less evenly distributed.

How we Overcame Expansion.

We had been in Bombay for over a week, and the "scaler boys" had been in the boilers every day from 7 A. M. to 6 P. M. The boilers on the passage out from London (thirty-four days) had been very "salt," owing to a leaky condenser. The deposit on the furnace crowns was in some places 5/8 inch thick; the wonder was that they had not come down.

I, as third engineer, had charge of the cleaning and overhauling of the boilers, and in order to fill the position with credit to myself, and honor to the United States, I took a course in Hindostanee profanity from the boss stevedore. A 2-foot length of 1-inch "Tuck's" packing, accompanied by "Jilde! Jilde!! Calascarao soor!!!" eventually did the trick. The scalers finished, and our own men had to "sludge" out the boilers, so as to get rid of the scale and dirt that had dropped to the bottom.

The wash-down hose was attached to the donkey pump and put into the manholes on the boiler tops, and the loose

scale was washed down to the bottoms. This in turn was raked out with the long fire rakes; but away at the back ends of the boilers was a pile of salt and dirt that the hose would not move or the rake reach, and one of the men had to go in.

Hanlon was a long, thin skeleton of a "Liverpool Irish buck," garrulous, witty and purblind with peering into the fierce heat of furnaces for many years, and so, because of his build, Hanlon was the man chosen. He stripped to the waist and in he went, cursing the fact that he was the skinny son of a skeleton father and an attenuated mother.

When all the dirt was out Hanlon started to get out, but the heat inside the boiler had swelled his body so that he could not get his shoulders through. He tried every conceivable way to get out—head first, feet first—but all to no purpose.

I tried to scare him out by telling him we would have to close up the boiler if he could not get out; then I tried to get him angry, so he would try to get out to have a slap at me, but all without success. At last he said in a very meek voice: "Mr. Silver" (the men never could get the hang of that name of mine), "Oi tink Oi cud git out if Oi hod a drap of the stuff in me." So I went aft and got a bottle of whiskey from the steward, took it down below and gave Hanlon a good stiff four fingers. "If you wud give me another of thim, Mr. Silver, Oi tink Oi cud git out, so Oi do."

This gave me an idea. I sized up the floor plates in front of the sludge hole, and, measuring with my eye how far I thought Hanlon could reach, I stood the bottle and glass on the plates just where I thought it would be out of his reach.

"Can't you have another try to get out?" He did, but without avail. "I'll be back in a minute, Hanlon; the chief is calling me." I ran off up the engine-room ladder, round through the alleyway to the "fiddley grating" (which is the grating over the stokehold). From this point I could get a good view of the whiskey bottle, and waited. In a minute or so I saw Hanlon's head poked out of the sludge hole. In a moderately loud voice (so as not to bring me if too far away) he said: "Are yez there, Mr. Silver?" (No answer.) "He's lift the stuff; bad cess to him, Oi can't rache ut." And out came a long, skinny arm and swept the floor plates in an arc of a circle, but he could not "rache ut"; then the arm was withdrawn and a long Irish hind leg was pushed carefully towards the bottle; but I had sized up the distance too well, and all his attempts to reach it were abortive. Then followed a short valedictory address in pure Celtic, consigning me to the backwoods of Hades. This was concluded by a regular Battle of the Boyne, and Hanlon emerged head and shoulders through the sludge hole.

Just then the chief *did* call me, and I ran off to go over a long list of repairs. An hour or so after, I got below and on going into the stokehold found Hanlon (whom I had completely forgotten) lying, gloriously overjoyed, with his head pillowed on a bag of ashes, talking away to himself for all he was worth. From the trend of his monologue, he evidently did not know he was out of the boiler yet. As I entered (unnoticed by him) I overheard the following:

"Tim Hanlon, ye was borrun undher a lucky starr, me bye, so ye wor. Who wud ho t'ought thus marnin, when that shpindle-shankit Yankee thurrd [that was I] sez, 'Turrn to, ye black dogs o' firemen'—who wud ha thought, Oi say, that Timothy, ma son, ye was pre-pre-foreordi-destinated to get siut into a biler full o' potyun [Celtic for whiskey]. 'Come out,' sez he. Oi can't, sez Oi. Nor Oi won't, sez Oi; and h——l roast the fut Oi sturr out o' this biler, sez Oi, till the last drap's drank." E. A. Suverkrop.

Magnetic Planer Clutch.

We show herewith a new application of electricity which has been under test in large sizes for about a year at the Schenectady works of the General Electric Company, to whose courtesy we are indebted for the photographs and blueprint from which the accompanying illustrations have been made. The device is the invention of Mr. John Riddell, mechanical superintendent of the works, and its operation has been so satisfactory that, in addition to the alteration of several existing machines, it is now being applied to all new machines to which it is suitable. In two cases its application has been to planers of 120 inches capacity between housings. Figs. 1 and 2 show it in its most recent form as applied to an 84-inch planer.

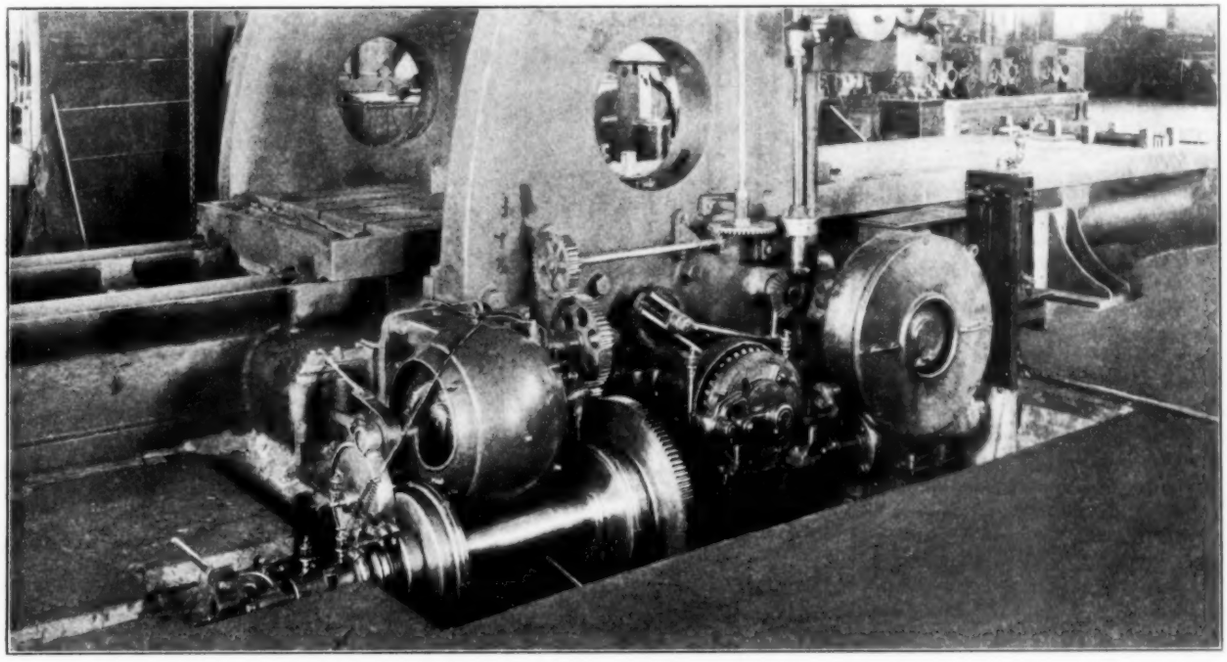


FIG. 1. RIDDELL'S MAGNETIC CLUTCH APPLIED TO AN 84-INCH PLANER.

The illustrations show the planer to be unchanged up to the worm drive of the platen and the feed mechanism. The changes begin at the left of the feed gear, where the worm shaft is extended to the left by a shaft *a*, Fig. 2, having two substantial collars *b c*, to which is splined by a working fit a sleeve *d* carrying two disks *e f*. Two magnetic clutches *g h* are journaled on shaft *a* and are revolved in op-

posite directions and at different speeds, corresponding to the cutting and return speeds of the platen, by the motor *i*, the arrangement of the gearing between motor and clutches being shown more clearly in Fig. 1. When the planer is at work the motor runs constantly in one direction, being started and stopped by the controller seen at the right in Fig. 1. The starting of this motor is equivalent to starting the countershaft of an ordinary planer. The direction of motion of the planer is determined by which one of the clutches *g h* has the current turned on to it, and this current is changed

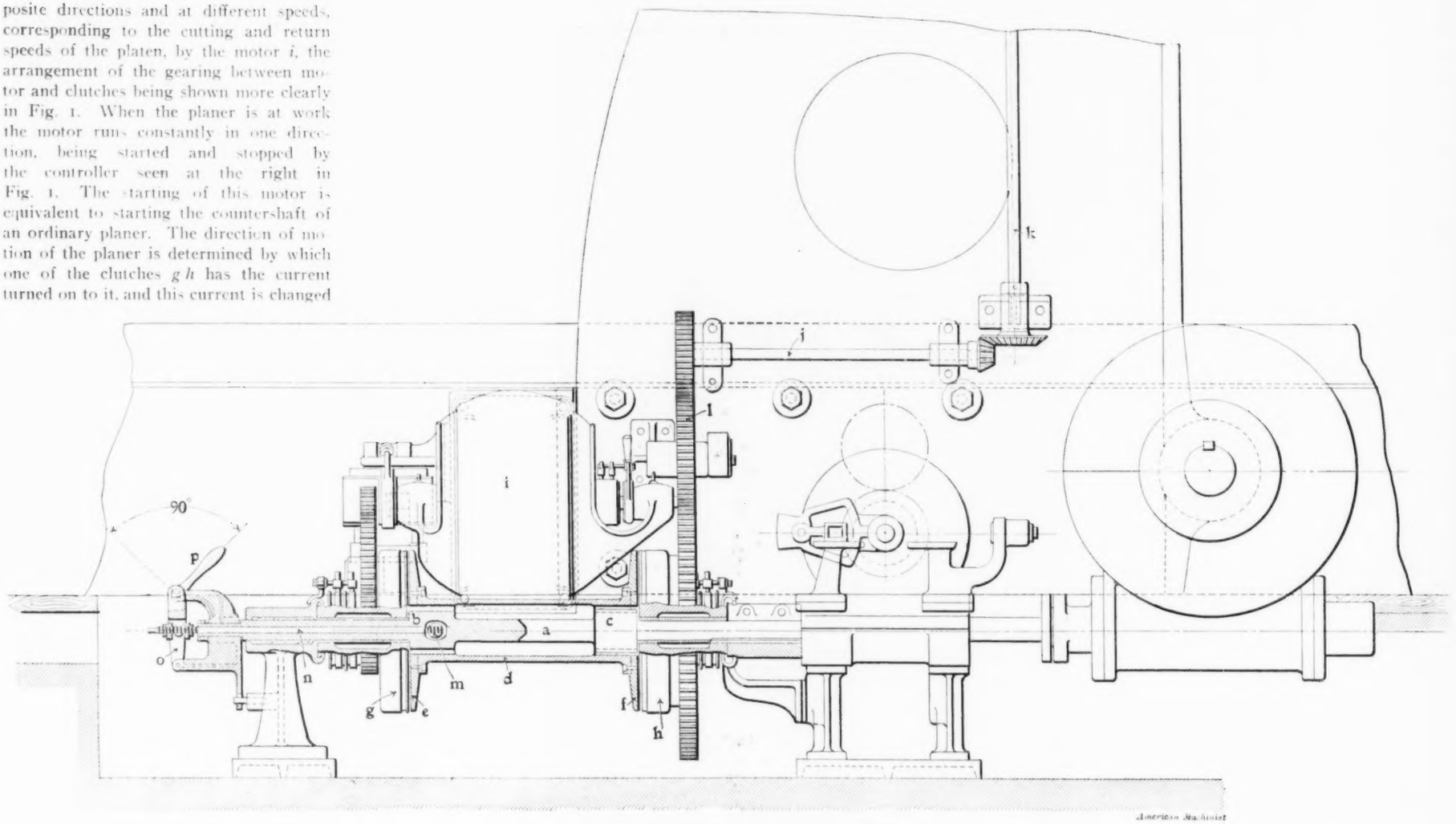


FIG. 2. SIDE ELEVATION OF PLANER AND MAGNETIC CLUTCH.

from one clutch to the other by switches on the planer bed, which are operated by the usual dogs on the platen. At each end of the stroke the action of the dog is to turn the current off from one clutch and on to the other. The magnetism of the live clutch then attracts its disk, sleeve *d* and disks *e f* sliding endwise on shaft *a* a small distance, the friction of the disk against its clutch, due to the magnetic attraction, being so great as to drive the machine.

The raising or lowering of the cross-rail is effected through the shafts *j* and *k* with their connecting gearing. An intermediate idler gear *l* may be slid endwise on its supporting stud and thus engage the motor shaft pinion with the cross-rail gearing, as shown more clearly in Fig. 1. Whether the rail is to be raised or lowered is determined by a tumble gear, not shown, or, for this purpose, the motion of the motor may be reversed by the controller. This reversal of the motor may also be used in operating the platen while setting up the work.

When it is desired to allow the motor to run without operating the platen, as in

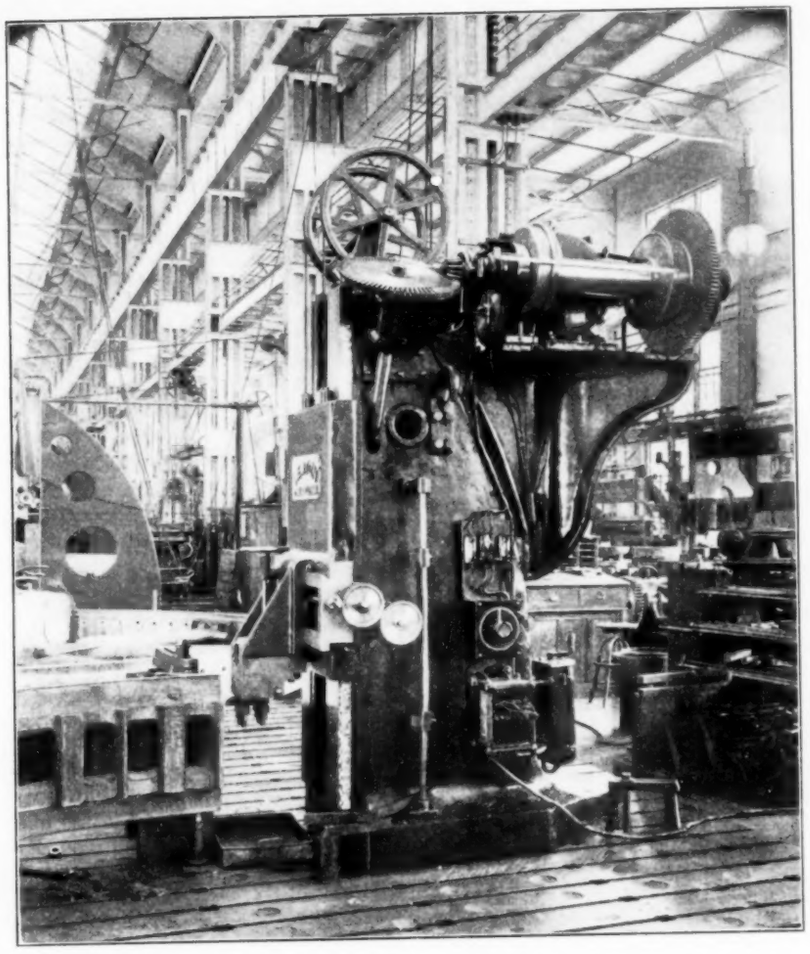


FIG. 3. MAGNETIC CLUTCH APPLIED TO A PORTABLE SLOTTING MACHINE.

adjusting the cross-rail or for any other purpose, a very neat device, shown at the left of Fig. 2, is used for placing the clutch disks in the neutral position. A steel plug *m* lies in an elongated hole across the shaft *a* and engages with the sleeve *d* so as to partake of its slight endwise motion. A rod *n* passes through a hole in the center of shaft *a*, and at its outer end engages a lever *o*, which thus oscillates slightly with the endwise motion of the sleeve. The upper end of this lever has an oblong hole whose greatest length is vertical. A small horizontal shaft, operated by hand lever *p*, passes through this hole, and where it is within the hole it is shaped to form an oblong cam. With the lever thrown to the left the greatest diameter of the cam is vertical, and lever *o* may thus freely oscillate with the movement of sleeve *d*. When, however, the lever *p* is thrown to the right, the greatest diameter of the cam is horizontal, and whichever way the lever *o* may have lain when the hand lever was in its left-hand position, it is, by the movement of the hand lever to the right, brought to its central position, and in coming to this position it necessarily brings sleeve *d* and disks *e f* to their central position.

Should the platen over-run for any reason, the dogs trip switches, the action of which is to turn the current off from the motor and from a solenoid brake, seen in the rear and to the left of the motor in Fig. 1. The brake is applied to the motor shaft and operates by gravity. So long as the current is on the solenoids they hold the brake from acting, but the instant the current is broken the brake acts and quickly stops the motor.

In the operation of reciprocating tools the system has many advantages. There is with this system no slipping and screeching of belts and the whole mechanism is practically silent. The reversing action is, moreover, much more prompt than with belts. Even the 120-inch planers will reverse practically at a line, and, because of the prompt reversing action, the stroke can be shortened to one-half of what was possible with belts.

The most important advantage, however, lies in the reduced effort on the part of the motor at the moment of reversal. This is well known to offer the most serious difficulty to the operation of planers by motors and to require the use of a much larger motor than is needed for the actual work. It is also well known that this effort is required for the reversal of the pulleys rather than the platen. Although the clutch faces are regularly oiled, their grip on the disks is so great that they require to be of only about one-half the diameter of the largest pulley formerly used, and, unlike the pulleys, the weight of the disks is not concentrated at their extreme diameter. This of itself makes the reversal much easier, but in addition to it is the flywheel effect of the clutches and armature, which, being positively connected and running at higher speed, are far more effective than the same weight applied as a flywheel to the countershaft. A flywheel on the countershaft can only make itself felt through the belts, and if these are already slipping, as they must be when the pulleys are reversing and the flywheel is needed, the real effect of the flywheel is small. Inasmuch as its energy is mostly expended in slipping the belts while that energy must be restored by the motor, some have, in fact, claimed that the effect of a flywheel on the countershaft is harmful rather than beneficial.

Fig. 3 shows the clutches applied to a portable slotting machine.

Low Pressure Hydraulic Elevators.

BY WM. BAXTER, JR.

Before the advent of high buildings, hydraulic elevators were quite simple in construction, and consisted of a cylinder, either vertical or horizontal, and a valve to control the flow of water. This valve was operated by pulling on the hand rope that passes through the car. For moderate speeds this arrangement works very well, the only objection to it being that, as the operating valve must vary in size with the size of the cylinder, the force required to move it will likewise vary. This difficulty can be easily remedied, however, by pulling the hand rope through a greater distance for large valves than for small ones.

For car speeds greater than 300 feet per minute, the hand-rope operation is not desirable, as even the most expert operators are liable to fail to pull the rope at the proper time to make a landing. For the purpose of making the control more certain, the simple hand rope has been replaced by a hand wheel or lever. With either of these devices, the distance through which the hand of the operator is moved is small, and to move the main operating valve directly would require the application of a greater force than most operators could exert, comfortably, for any length of time. To reduce the force required to turn the hand wheel or move the lever, a small pilot valve is used, this being moved by the movement of the lever. This pilot valve acts in conjunction with an auxiliary piston to impart motion to the main operating valve.

The general arrangement of a vertical cylinder elevator, the operating valves and the elevator car is shown in Fig. 1. Vertical cylinders are used in all cases where

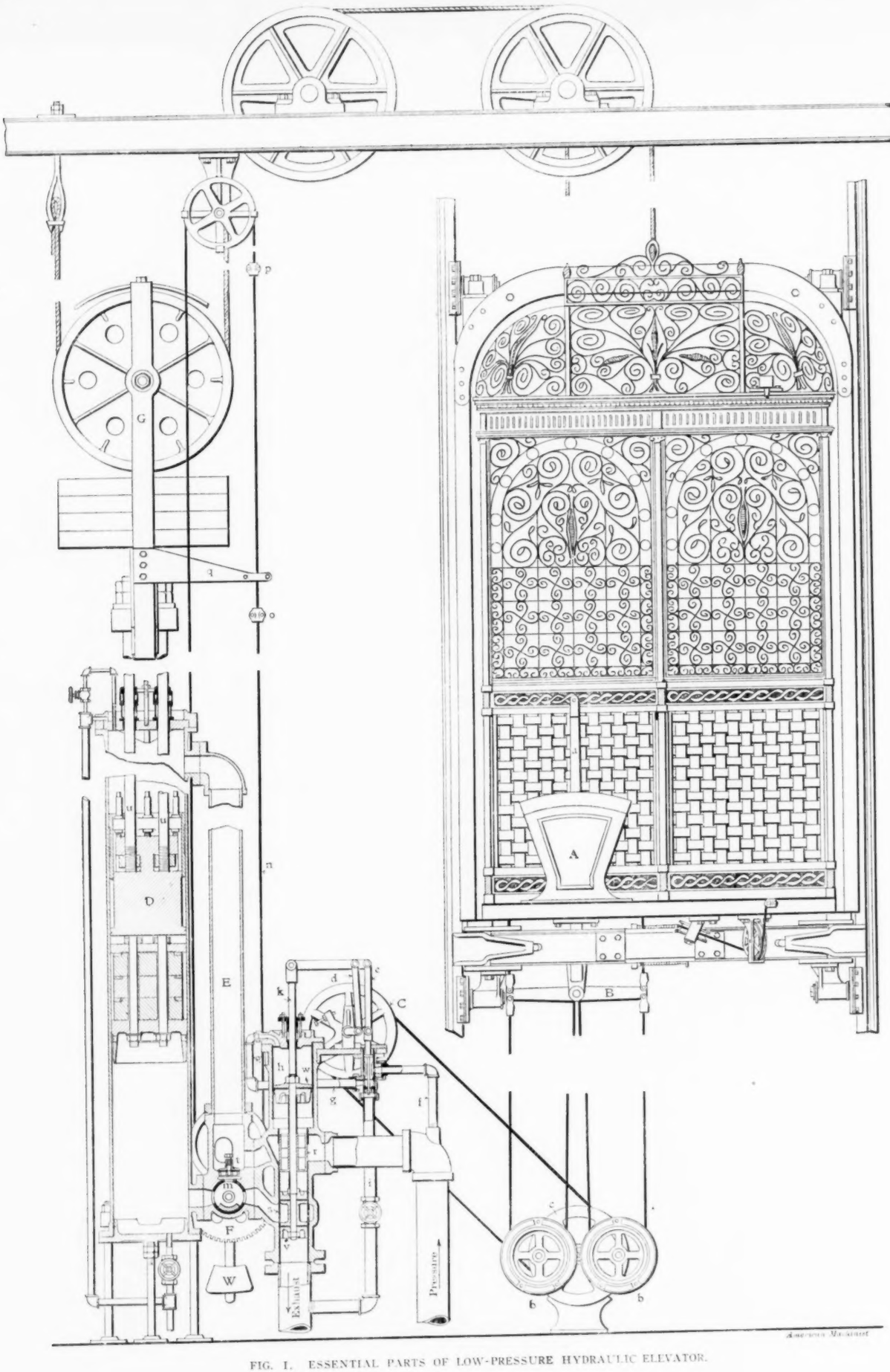


FIG. I. ESSENTIAL PARTS OF LOW-PRESSURE HYDRAULIC ELEVATOR.

the floor space is limited. When this limitation does not exist, the use of a vertical or horizontal cylinder is largely a matter of choice. Fig. 1 shows a cylinder geared 2 to 1, the lifting ropes being secured to the car at one end and to a stationary support at the other, and passing under the sheave held in the strap *G*, which is connected with the cross-head to which the piston rods *u u* are secured. This arrangement is only used for low buildings; for greater hights, the gear is generally 4 or 6 to 1.

The lever *a*, projecting above the casing *A* in the car, controls the motion of the lifting mechanism. The rocking beam *B* is connected with the lever *a*, and the ropes that pass under the sheaves *b b* are attached to the ends of *B*. At the top of the elevator well there is a pair of sheaves similar to *b b*, and the rope that passes under the right-hand sheave at the bottom passes over the left-hand one at the top. As a result of this arrangement, if the left end of *B* is depressed, the left *b* sheave is also depressed, and as both the *b* sheaves are connected with sheave *c*, the latter is rotated through a corresponding angle, and thus sheave *C* is turned.

The movement of the lever *a* toward the left causes *C* to rotate in a counter clockwise direction, and the short crank mounted upon the same shaft forces the connecting rod *d* upward. As the piston rod *k* carries the large piston *w* and piston valve *v* it cannot move as easily as *e*, which carries the small pilot valve; hence the *k* end of the lever acts as the fulcrum, and *e* is raised. The lifting of *e* places the pipes *g* and *i* into direct communication, and thus the water on the upper side of piston *w* can escape. As the piston *w* is of larger area than *v*, the pressure on the under side of it is greater than on the upper side of *v*; therefore both valves are lifted by the pressure of the water. It will be observed that the mechanism is operative without valve *r*. This valve has taper ends, as shown in Fig. 5, and it is, moreover, a loose fit in its seat. Its object is to insure a more gentle action. Its looseness in its seat gives sufficient communication between the pressure pipe and the space between piston *w* and valve *v* to maintain the pressure in this space and to permit the enclosed water to escape on the downward movement of the parts.

When the valves are lifted, the throttle valve *r* uncovers the opening of the pressure pipe, and the water passes through to pipe *E*, and thus to the upper side of the piston *D*, causing the latter to descend.

If lever *a* is moved to the right, sheave *C* will be rotated clockwise, and then rod *e* and the pilot valve will be depressed. This movement of the pilot valve opens the connection between pipes *f* and *g*, and thus admits water under pressure on the upper side of piston *w*. The lower side of *v* having no pressure against it, the ports move downward, and the water in the upper end of the cylinder will be able to flow down through pipe *E*, through port *s*, into the lower end of the cylinder. Thus it will be seen that in this way the pressure is removed from the upper side of the piston *D* and the water simply circulates from one end of the cylinder to the other. On the next downward stroke of piston *D*, valve *v* will be raised, and the water in the lower end of the cylinder will escape to the discharge pipe, while a fresh supply of water under pressure will fill the upper end of the cylinder.

If lever *a* is moved as far as it will go in either direction, the sheave *C* will be rotated through the maximum angle, and the valve *v* will be opened wide. If lever *a* is moved only a portion of the distance, the sheave *C* will likewise be rotated only a portion of its maximum movement. This short movement will open the pilot valve a short distance only, and as the upper end of *d* acts as a fulcrum, as soon as *w* begins to move, it can be easily seen that before *w* advances very far, the pilot valve will be moved back to the stop position; and as soon as the pilot valve reaches the stop position, the movement of *w* will be arrested. Thus it will be seen that the control of the movement of the main valve *v* is just as positive as it would be if lever *a* acted directly upon it, while the effort required to move *a* is very much reduced, as it only encounters the resistance of the small pilot valve.

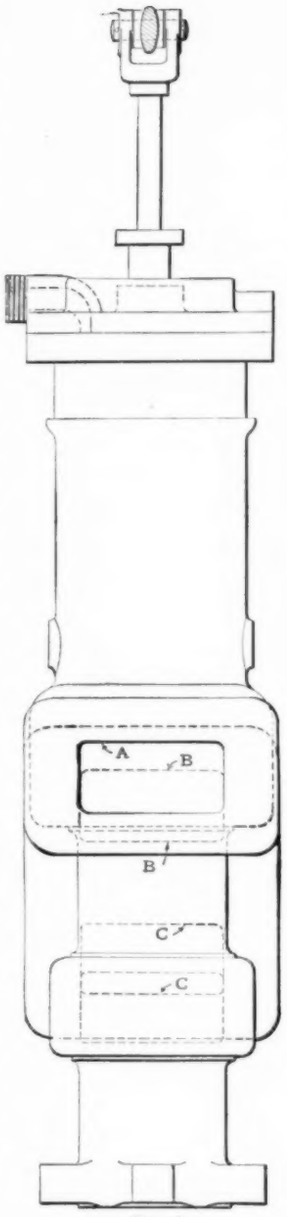


Fig. 3

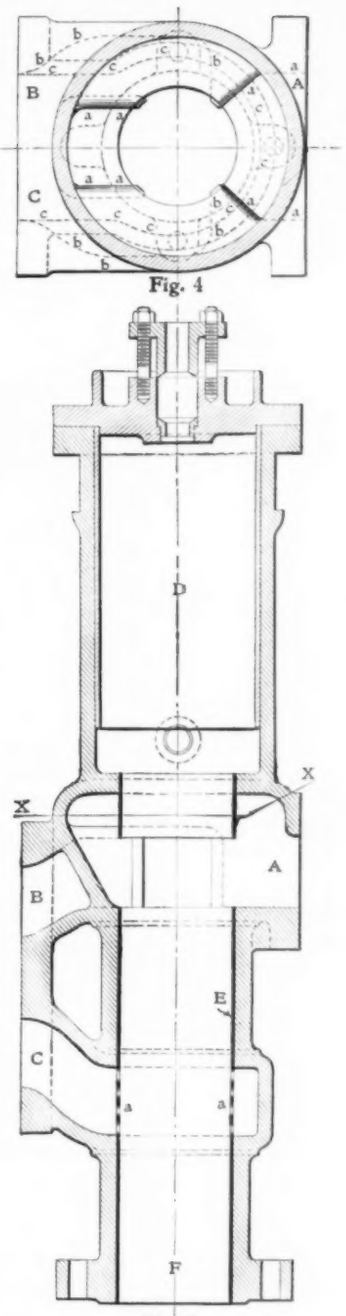


Fig. 4

Fig. 2

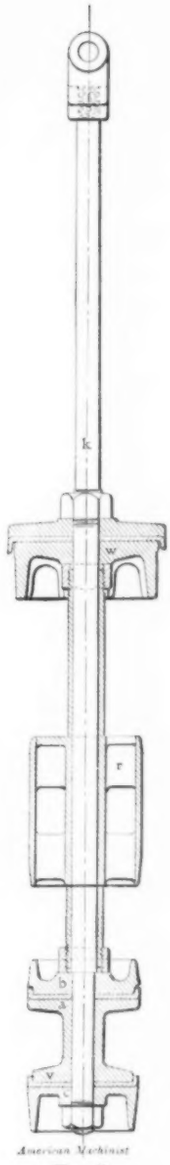


Fig. 5

DETAILS OF MAIN VALVE.

As the elevator operator is liable to forget to stop the car before it reaches either the top or the bottom landings, it is necessary to provide means for stopping it automatically. This is accomplished by means of valve *m*, which is rotated by the movement of rope *n*. The sheave around which this rope passes is mounted upon a shaft that carries a pinion that meshes into the gear *F*. The weight *W* serves to keep the valve normally in the open position. When the arm *q* strikes either

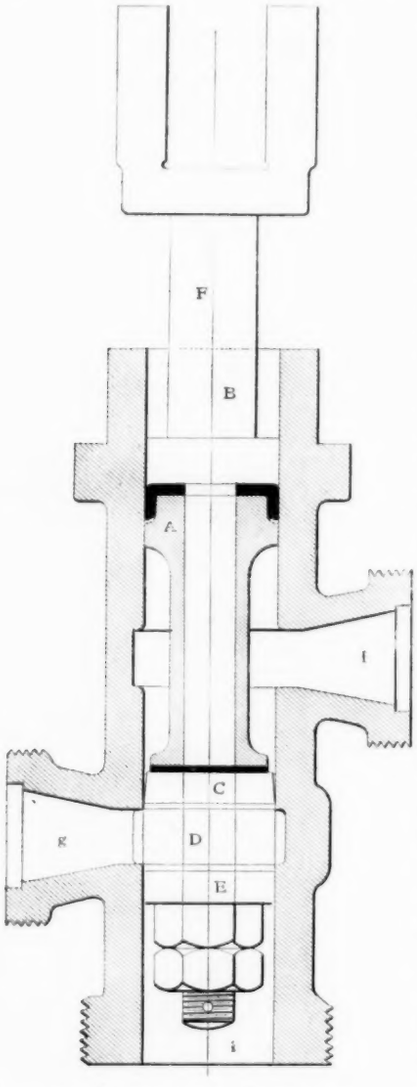


FIG. 6. DETAILS OF PILOT VALVE.

one of the stops *o p*, *m* is turned so as to prevent the entrance or escape of water from the lower end of the cylinder, and thus the motion of piston *D* is arrested. When the piston moves down, the water under it must escape into the discharge pipe, so that if the passage is closed by *m*, *D* cannot move. When the piston moves upward, the water must circulate from the top to the bottom end, and if the passage is closed at *m* it cannot do so; thus for either direction of motion of *D* the closing of valve *m* brings it to a standstill.

As the water in the cylinder is practically incompressible the elevator car would be brought to a very sudden stop if the operating valve were closed too rapidly, but this difficulty is avoided by providing a relief valve at *t*. This valve only acts when the piston *D* is moving down. When the piston is moving upward, if the operating valve is closed suddenly, the water flows back into the pressure pipe through valve *r*.

The construction of the valves is not shown very clearly in Fig. 1, but they can be readily understood from Figs. 2 to 6, which are on a larger scale and free from the complication of other parts. Fig. 2 is an elevation in section of the main valve chamber. Fig. 3 is an exterior elevation taken at right angles to Fig. 2, and Fig. 4 is a plan in section on line X X of Fig. 2. The several parts are marked similarly in the three drawings. The pressure pipe connects with port *A*, and port *B* connects with the upper end of the hydraulic cylinder, while port *C* connects with the lower end of the cylinder. The internal chamber connecting with port *A* is indicated in Fig. 4 by the lines *a*, *a*, *a*, *a*, *a*, *a*, and the outline of port *B* chamber is in like manner marked *b b b b b b*, while that of port *C* is marked *c c c c*. The openings into the *A* and *B* ports are at right angles to each other, so that the water from *A* enters the valve chamber on two sides and passes from this chamber into port *B* on the two intermediate sides.

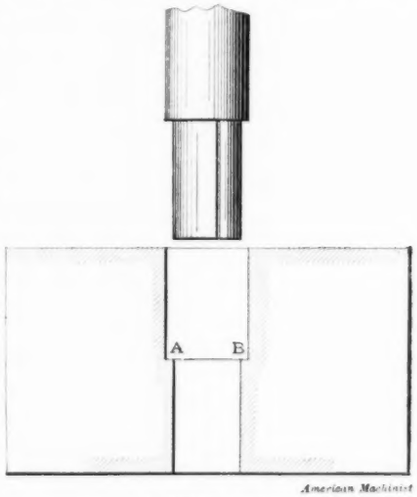
Fig. 5 shows the auxiliary valve *w* and the main valve *v* and also the throttle valve *r*. Both *w* and *v* are provided with cup packings, and as these cannot slide over open ports the brass lining *E* is perforated with numerous small holes *a*, opposite port *C*.

Fig. 6 shows the pilot valve and chamber in vertical section. A cup packing is provided at the upper end between *A* and B, but the valve proper, which consists of *C D* and *E*, has no packing, being simply a good metallic fit. This valve is made in one piece, but the ends C D are tapered so as to obtain a more gradual opening of the valve. If in any particular instance it is found that the valve does not open fast enough the ends are tapered off more, or the opening may be increased by simply filing grooves with a three-cornered file, these commencing at the lines that form the boundary of the parallel portion *D*. From this figure it will be seen that a slight upward movement of the valve will open communication between *g* and *i*, and that in like manner a slight downward movement will open communication between *g* and *f*.

These illustrations show one of the several types of hydraulic elevators made by the Otis Elevator Company, and is known as the vertical low-pressure system. It is used with pressures ranging from about 200 pounds per square inch down to 25 or 30 pounds. The same company makes two other types of hydraulic elevators, one known as the high-pressure system, which is intended for pressures from 700 to 1,000 pounds per square inch, and the double power or pressure system, which is operated with water at two different pressures. With this latter arrangement, the low pressure is used for lifting light loads and the high pressure for heavy loads, the valve gear being so arranged as to shift from one pressure to the other instantly. This latter system has a decided advantage over the single-pressure systems in point of economy of operation, as can be readily understood. Hydraulic elevators are also made so that the valves are operated by means of electro-magnets and the operating lever in the car is replaced by an electric switch or a number of push buttons. The systems above named and the electric controlling arrangements will be considered in future articles.

Pressed Fits and Securing Babbitt in Bearings in the Bollinckx Shops.

We have previously referred to the fact that in the establishment of H. Bollinckx, of Brussels, Belgium, they dispense almost, if not entirely, with keys in erecting their engines, and depend upon pressed or shrunk fits. In this connection Mr. Bollinckx sends us a sketch, Fig. 1, which he explains as follows: "In order to easily press the rod or shaft into place, we give it two diameters, and we also bore the piece into which it is to be pressed in two

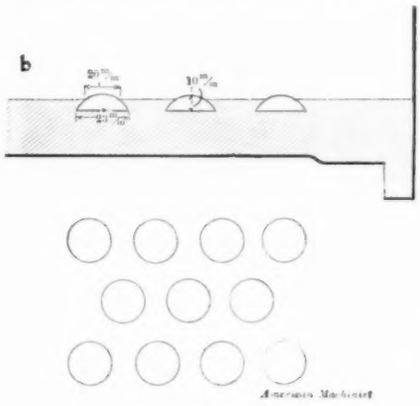


PRESSED FITS.

diameters to correspond. In this way we are able to introduce the rod or shaft for half its bearing before the pressing or driving begins, so that we have to press it only half the distance that would otherwise be necessary; and, besides, the shaft is accurately guided from the start, and has little tendency to cut or grind.. The heavy line on the smaller diameter of the shaft, Fig. 1, is a groove made there to permit the escape of the air, which would otherwise be caught between the two

shoulders and would have no means of exit."

The sketch, Fig. 2, shows the practice of this concern in fixing babbitt into bearings. Into the mold are placed a certain number of small cones of sand, which are



SECURING BABBITT.

made in an iron mold. This causes a certain number of little conical holes which are largest at the bottom and which secure the babbitt in the bearing in the strongest possible way.

The Electric Motor as an Instrument for Awakening Thought Among Workmen.

"The reversibility of the Gramme machine was one of the most important discoveries of modern times."—Prof. James C. Maxwell.

Editor American Machinist:

Altogether aside from the ordinary function which the electric motor discharges, it produces one result that is sometimes overlooked. It is doing not a little, we think, towards inciting the workingman to think. This result it effects through the element of wonder, so largely connected with its mode of operation. There is no other machine so well fitted, we think, to bring about the effect referred to.

In several very important respects it differs essentially from most of the other machines in daily use in the shop. There is, *e. g.*, no visible means by which force is set up and maintained in it. The transmission of energy by belting is a thing easily observed and understood. There is, on the other hand, no actual evidence of motion in the source from which the motor obtains its power. How is it, asks the workman, that it can attain the speed it does, when to all appearance there is nothing but a few tiny, motionless wires to connect it with the dynamo?

Here, he says, is a long stretch of shafting, a whole set of pulleys and countershafts, a big collection of powerful machines and machinery, put in motion by a motor receiving the power to do so through wires apparently inadequate to perform such a task. The energy that can perform such a feat must certainly differ from the energy that drives the belt. But in what respects he knows not, though often instigated by the wonderful character of the power to understand better about it.

Then, again, the workman is aware that unless strongly and closely connected throughout its entire length, no belt can effectively perform its task. In respect of motor motion the case is entirely different. Here the cohesive force of such material as belting to transmit energy is dispensed with. Indeed, there could be no motor motion, no transmission of energy as effected by the motor, but for the capability of the magnetic force to bridge a certain open space. Were the power of the motor at all like the power that puts the belt in motion, there could be no motion of spindle or armature whatever. There must of necessity be a division of some sort between the motionless and the movable portions of the motor. How is it, asks the ordinary workman, that this result is obtained? Yet when he begins to reflect upon it, he finds it not so strange or unusual as at first he thought. In the common horseshoe magnet and the iron which it draws towards it he finds an illustration of the capability of bridging space in just such a manner. In the electro-magnet, with its armature suspended from a spring and connected with it by a wire, a battery and a key, he finds an illustration of the same result, and thus gradually he comes to see, in somewhat contradictory experience to his limited observation, that it is possible for motion to be transmitted as it is by the electric current over spaces that thus separate the conducting materials.

It is indeed a most interesting part of the observation to note just where this bridging occurs; for it throws a flood of light upon the difficulty commonly felt by everyone in the workman's position, in realizing how the motor can transform electric into mechanical energy, and how it is possible in almost all cases to dispense with belting, not only in the room but also on individual machines themselves.

Looking, too, at the history of this strange machine, the workman will find his interest in it whetted to a degree that he cannot for a time fully appreciate. It is *par excellence* a machine that ought to command his attention, for it was by a workman that the great secret was unveiled of the motor's oneness with the dynamo and the capability—through its reversibility with the latter machine—to revolutionize the entire system of transmission in the workshop. The double application of the generator as a motor as well as a dynamo was not known until 1873. As a dynamo it had revolutionized the older system of obtaining electricity—as a motor its efficiency to reverse this operation had never been displayed. Here was indeed something to astonish, something to create wonder and excitement.

All at once, and without the pains usually attending the birth of a new invention, a new discovery—the motor—was introduced to the world.

Strange, too, that all this should have come about by a mistake of an ordinary workman. Could he have known on that eventful morning when he entered, perhaps so listlessly, on his ordinary toil, what a secret he was going to unfold, what a treasure upon which he, poor man, was never to lay his hand, what pangs must have filled his breast, what longings, what thought, what fears, must have occurred to him. But, alas! as in so many cases, the results of his discoveries were not to belong to him. He was not to appropriate them. It was to Gramme, of Paris, that the fruits of this discovery were most lavishly to come as an individual observer of this man's accident. He it was who turned the secret to account. He it was who saw in its reality the promise and potency of untold wealth. From Gramme's time until now the motor in its full application has been an accomplished fact. Its oneness with and yet difference from the dynamo in its ordinary, everyday application has been revealed, and we who live in daily observation of its work can realize, to some extent at least, the vastness, the greatness, the miracle of the discovery, and its influence in inducing thought.

JAMES WILSON.

An Electrically Driven Radial Drill.

We illustrate an electrically driven radial drill in which the motor is more completely embodied as an integral part of the machine than has been usual in previous applications. Fig. 1 is an elevation showing the front side of the radial arm with the column in section. In the halftone, Fig. 2, we have an end view of the arm when swung around at right angles to the base, and the back of the arm when nearly parallel with the base.

This drill has two motors, one for raising and lowering the arm and one for driving the drill spindle. The hoisting motor is mounted within the upper part of the column, with the armature shaft vertical, and with the necessary reducing gear connects directly to the elevating screw. This motor has plain series windings, and is operated by the small handle shown on the side of the column. This handle operates a controlling cylinder inside the column, the starting, stopping and reversing all being accomplished by the movements of this handle.

The weight of the column and arm is supported by the crossbar *C* on a ball bearing, as shown in cross-section at *B*. This bearing can be adjusted for hight by means of the screw and lever, so that the base of the main column will just clear the bed plate when the clamping ring is loosened. The clamping ring has four spiral springs under it let into recesses, which raise it slightly when the screws

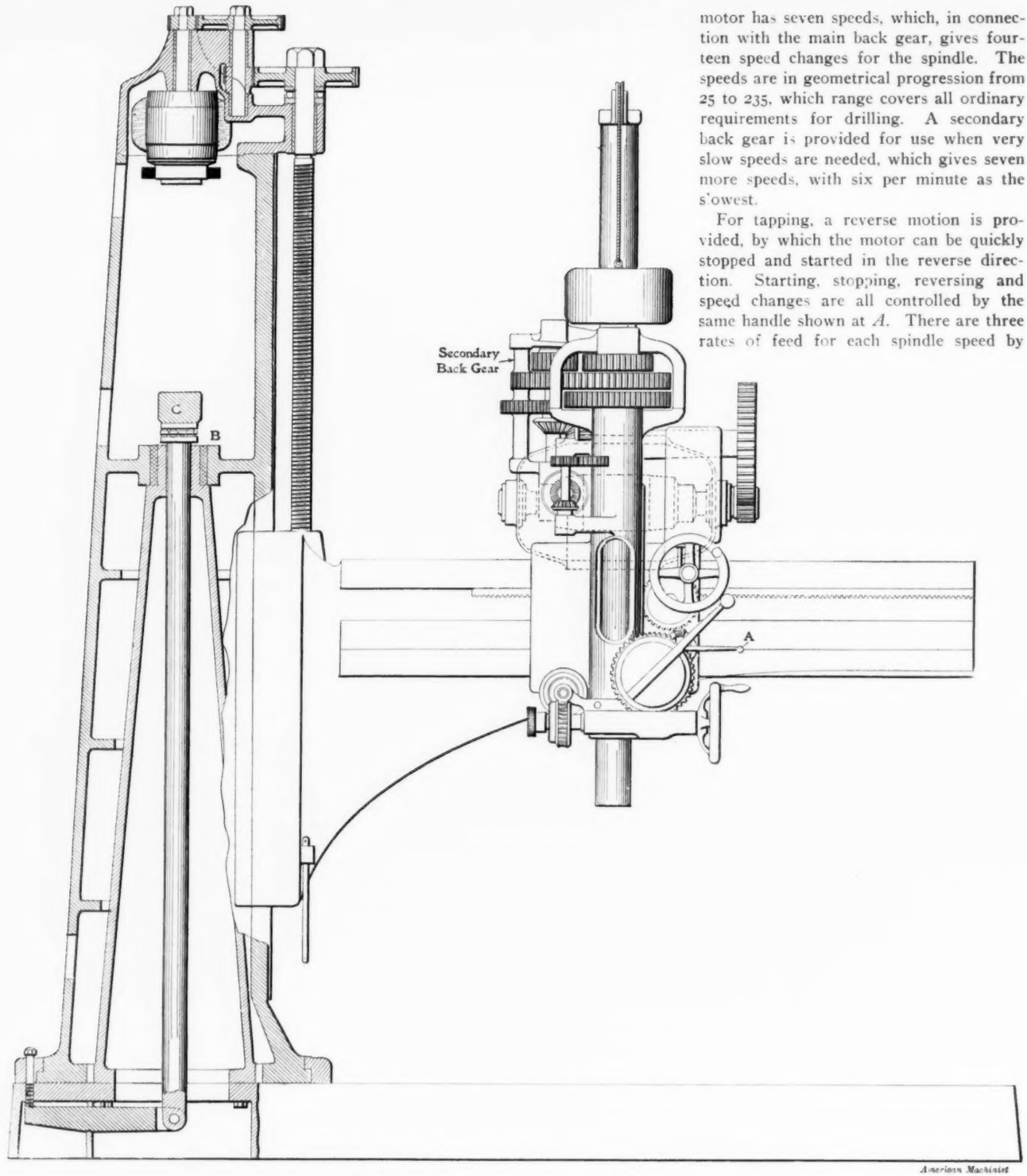


FIG. 1. AN ELECTRICALLY DRIVEN RADIAL DRILL WITHOUT SHAFTS.

are loosened. For ordinary drilling it is necessary only to tighten one screw to hold the arm from swinging. There is sufficient spring in the horizontal supporting bar to allow the column to be drawn down solidly on the bed. If it is desired to have the column very rigid, part or all of the screws may be tightened. By this method of clamping the column the inner stump is only used while the arm is being swung into position, and is not depended on to take any of the strains of drilling or boring. The arm can be swung completely around, allowing work to be drilled anywhere within the circle, and the machine can be set anywhere that a wire can be run, without regard to line shafts or to the location of a countershaft.

The motor for driving the spindle is completely built into the head, and the power is applied directly to the spindle without being transmitted through any long shafts or belts. The main back gears are located directly on the spindle. The motor has seven speeds, which, in connection with the main back gear, gives fourteen speed changes for the spindle. The speeds are in geometrical progression from 25 to 235, which range covers all ordinary requirements for drilling. A secondary back gear is provided for use when very slow speeds are needed, which gives seven more speeds, with six per minute as the slowest.

For tapping, a reverse motion is provided, by which the motor can be quickly stopped and started in the reverse direction. Starting, stopping, reversing and speed changes are all controlled by the same handle shown at *A*. There are three rates of feed for each spindle speed by means of cone pulleys so located as to be easily accessible, and so that the belt can be shifted with the least possible effort. All the operating handles are close together and within easy reach of the operator.

The following are the principal dimensions: Will drill to the center of a 120-inch circle; greatest hight from spindle to base, 68 inches; smallest diameter of spindle, 2 inches; traverse of spindle, 17 inches; spindle has Morse taper No. 5.

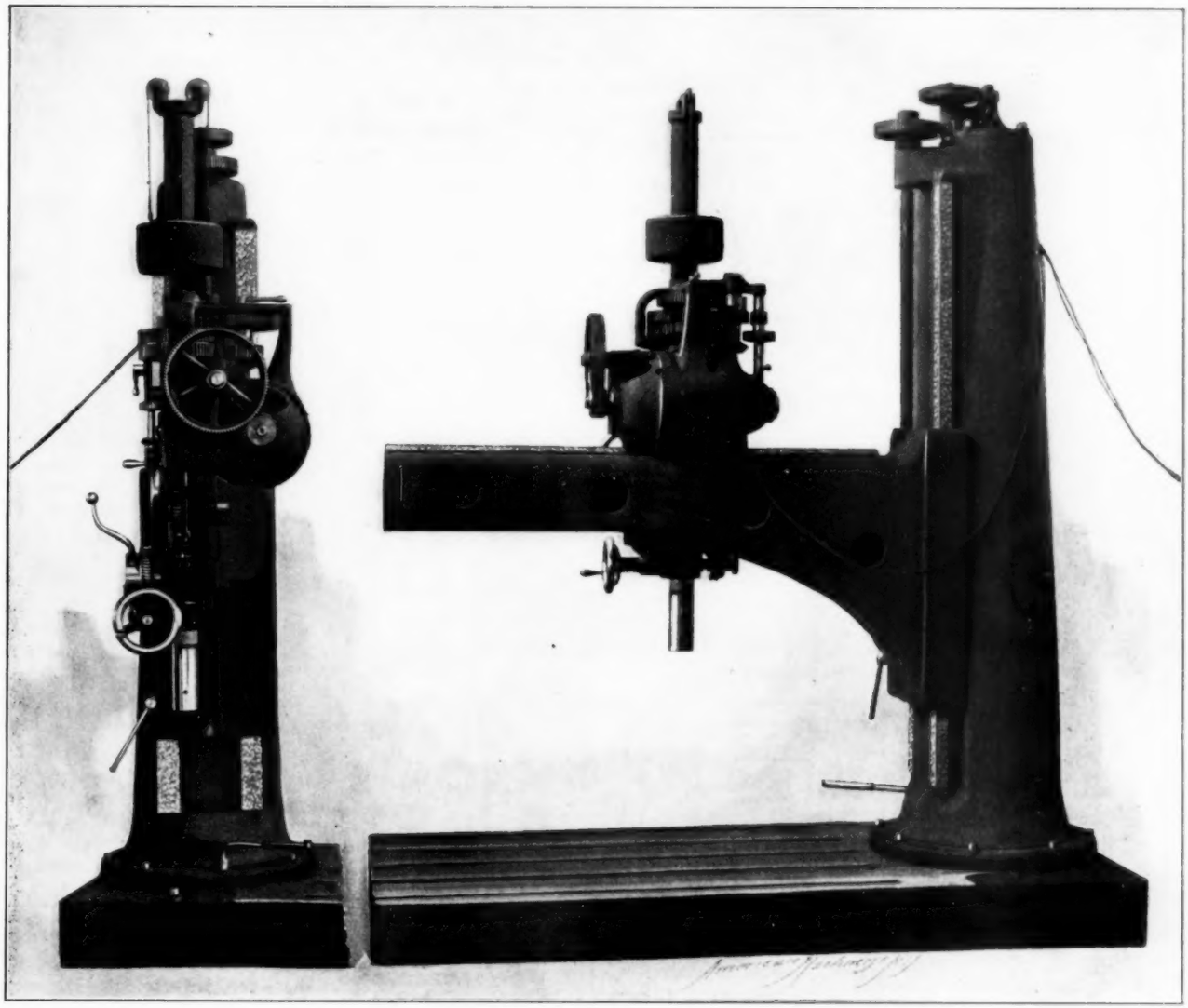


FIG. 2. AN ELECTRICALLY DRIVEN RADIAL DRILL.

The drill was designed by Chas. E. Willey, and is built by Jas. Clark, Jr. & Co., Louisville, Ky.

Machine Shop Soldering.

BY C. H. WILCOX.

Among the recollections of my boyhood is one of my mother trying to solder her kitchen utensils with the stove hook and a bar of solder. It was usually a case of "Haste makes waste," for father had to finish the job. As I grew older I became the family tinker, and I soon learned from experience that a soldering iron with the tinning burned off was little better than a stove hook. Watching a tinsmith one day, I learned that an easy way to tin the soldering iron was to rub it on a brick covered with solder and rosin. This answered as well as filing it bright and rubbing with acid and solder.

There are many kinds of solder, from that which will melt in boiling water to hard brass solder that melts only at white heat. As a rule, the harder the solder the stronger the joint. Of the white solders, silver is the hardest. For all solder that requires a red heat, borax is used as a flux, and the solder will run anywhere the borax goes. Rubbing the joint with a pointed piece of iron will help the solder to run into the joint. The parts to be soldered should of course be cleaned. The solder will not stick to the work until the surface of the work is heated to the melting point of the solder. Don't try to solder with a cool iron, and, with large pieces, heat them to the melting point of the solder or use a very hot iron. Always use a solder with a much lower melting point than that of the metal to be soldered.

I have lately seen solder put to a new use, in the making of lathe tools for screw machines, these tools taking the places of those formerly forged by the blacksmith. They are superior to all the patent lathe tools on the market and do better work. If I had not seen them in constant use, I should be a little skeptical about their staying together; but in this respect they have proved very satisfactory.

The sketch, Fig. 1, shows a spring forming tool. The form is to be soldered on to the part *A*, which makes a shoulder for it to rest upon. Fig. 2 is a diamond point with the point soldered on. In soldering on these points, first tin the surfaces to be placed together, brush off any surplus solder with a stiff brush, place the parts together and solder them. Be sure and fill the corner spaces marked *A* on Fig. 2, full of solder. In getting the solder well into the corners there will be trouble in using the usual form of soldering iron. Irons shaped like Figs. 3 and 4 are much handier for such jobs and they answer for work in general.

We use a great many form cutters and forming reamers made with inserted blades, which are soldered in. Fig. 5 shows two views of a forming reamer. When the blades are worn out they can easily be replaced by new ones. In soldering these blades in place, cover the slots *a* and the blades with solder. Brush away

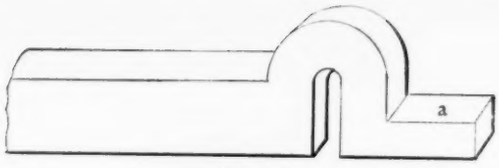


Fig. 1

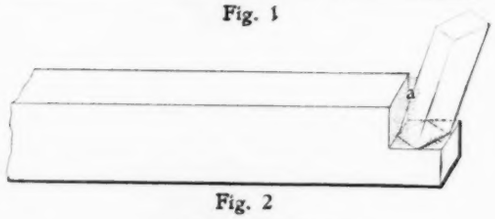


Fig. 2

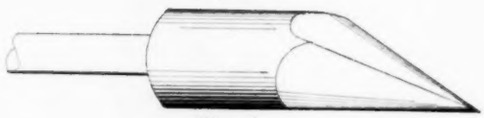


Fig. 3

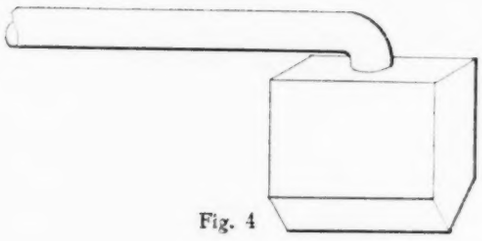
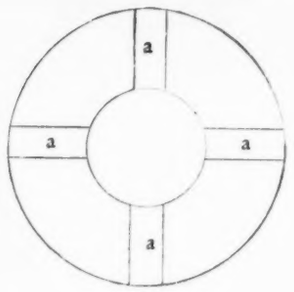


Fig. 4



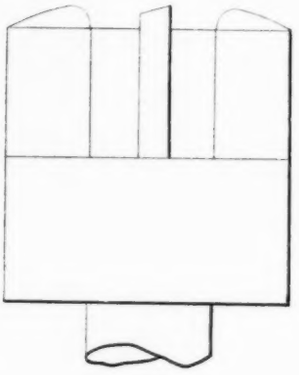


Fig. 5

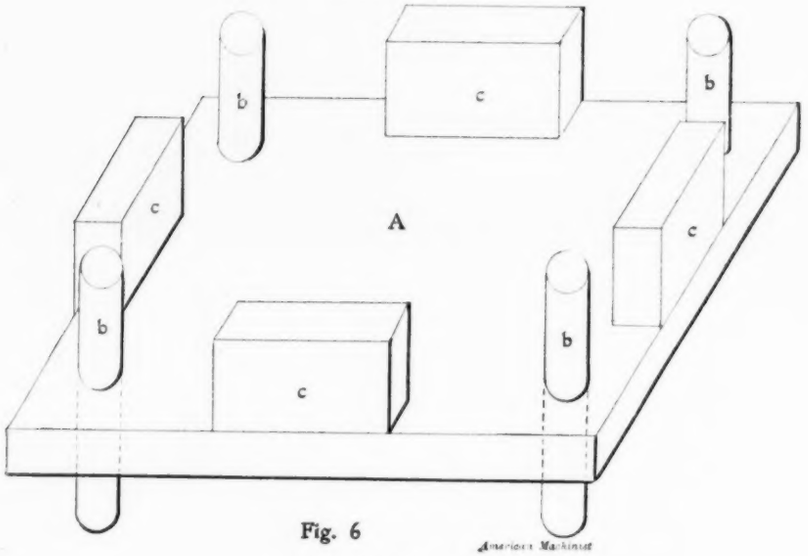


Fig. 6

MACHINE-SHOP SOLDERING.

all surplus solder, as this is necessary in order to get the blades in exact position, then solder them in place.

Use a clean soldering fluid. There are many on the market, but muriatic acid and zinc is as good as any. After the soldering is finished, the work must be carefully cleaned to prevent rust. To do this, dip it in hot soda water and then cover with oil.

Solder can be of great use to the machinist. There are many pieces too small to strap on the face-plate; solder such pieces to a flat piece of iron large enough to fasten on the face-plate, and the difficulty is overcome. The hardened knife straight-edge is soldered into a groove in an arbor before grinding. In order to machine irregular shaped pieces it is often necessary to build them out by soldering on pieces of metal. Filling out a piece to be held for planing keeps it from springing. I have known large pieces to be bedded in plaster of paris for this same purpose. In a jobbing shop where there are a number of irregular shaped pieces to be milled, yet not enough to pay for building fixtures, the milling machine vise can be rigged up to hold the work by removing the hardened jaws and replacing them by jaws of babbitt or type-metal. In all irregular shaped pieces certain bearing points must be selected, whereby the work may be held steady in the fixture. These are obtained by filling out the piece with fireclay or putty. To make the jaws of babbitt, remove the hardened jaws of the vise, replacing the screws, and fasten the work in the desired position in the vise. Place a parter of cardboard through the middle to allow the jaws to open after casting. Put pieces of sheet metal over the ends of the vise, and run the metal around the work to make the jaws.

For milling this work an ordinary fly cutter can be used. For more rapid work a cutter can be made by inserting blades in a worn-out milling cutter. To shape these blades, make a single blade of ¼-inch steel, the shape of the required work. Place this in the milling machine vise and feed down the cutter to be formed.

After the pieces have been milled you may need to drill holes in them. For this a cheap drill jig may be made with the help again of the soldering iron. Fig. 6 shows the base of such a jig. Pins *b* are driven through the cast-iron base *A*, forming the legs on which it stands, and also guide-posts for the top part. Place the sample piece on the base *A* and put set-screws under it to hold it. Also put set-screws in the blocks *C* to hold it at the sides. Place pieces of drill rod or drills in the holes which have been drilled in the sample piece. Make bushings for these drills and for the corner posts. Put them on the drills and posts. In a piece of sheet metal the size of the base *A* rough out holes that will loosely fit over the bushings. Tin this piece of sheet metal and the bushings. Place the metal over the bushings and put a tinker's dam around the edge. Cork the holes around the bushings with putty or clay and then cover the whole with solder. If, instead of the sheet metal, thicker metal is used, the bushings can be simply soldered in place in the holes. The jig is held together by screws or clamps.

A Vertical Shaper Attachment for the Milling Machine.

The half-tone shows in use a device which practically converts a milling machine into a vertical shaper, or, as usually miscalled, a slotting machine. It is especially serviceable in working out dies for punching presses, following any outline, regular or irregular, and giving the required clearance all around. As will be seen, the attachment may be used upon any milling machine of the standard type, and when once fitted may be slipped on or off as required.

The large vertical casting seen in front clamps on to the overhanging arm of the machine and a spindle below is driven by a taper shank which fits the machine spindle. Between the two bearings which are provided for this spindle it has secured to it an eccentric or cam which operates a horizontally sliding block which works in the cross slot of a vertical slide carrying the cutting tool. The vertical

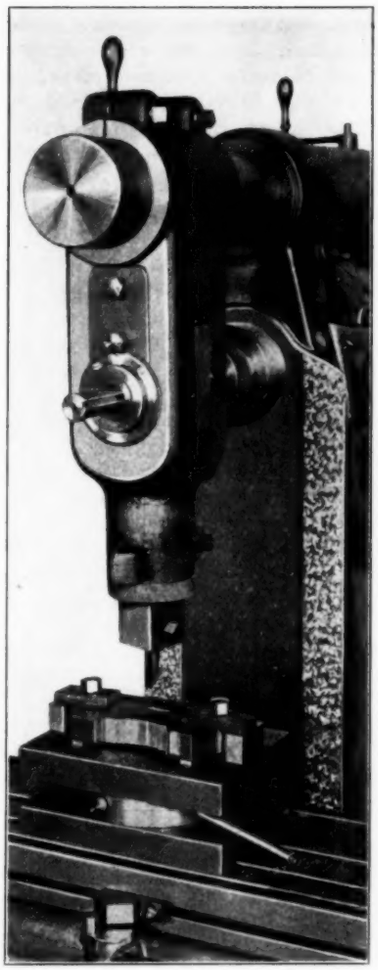


FIG. 1. A DIE-SHAPING ATTACHMENT FOR THE MILLING MACHINE.

stroke obtained is 1⅜ inches. The cutting tool is made of ½-inch round steel secured in the socket by a set-screw. This tool socket is separate from the vertical slide, and when the tool is set it may be turned around as required, so that any outline may be followed and all corners may be worked into. Fig. 2 is from a working drawing showing the construction and arrangement. A clapper block, not here shown, has been provided, which gives perfect clearance for the tool on the up-stroke.

The half-tone shows the tool at work upon a half-die of irregular outline. This die is mounted upon a tilting chuck which accompanies the attachment and provides the necessary clearance angle for die work. The construction is shown in Fig. 3. It will be noticed that the middle face between the rings is oblique and by turning these the pitch is thrown in the different directions required, a locking pin, a clamping screw and a bar for turning the rings being provided. The central post has a spherical head, so that it can incline as the angle requires and still hold the parts securely. A chuck with rotating feed is also furnished, so that any circular outlines may be followed by the tool automatically. The attachment is made by the Vertical Die Shaper Company, 77 Water street, Rochester, N. Y.

Books on Astronomy.

Our description of some of the work done at the establishment of Warner & Swasey, of Cleveland, O., has brought a number of inquiries for further information regarding the instruments there referred to.

The study of astronomy is one which usually has a peculiar fascination for those who are interested in mechanical matters. Astronomy is itself what may be called a glorified system of mechanics, and it forms a very interesting study or pastime for those who have mechanical tastes.

We have on this account asked Messrs. Warner & Swasey to name some books adapted for those who wish to get some knowledge of the science and to be acquainted with the principles of the instruments used by astronomers. They reply in the following letter:

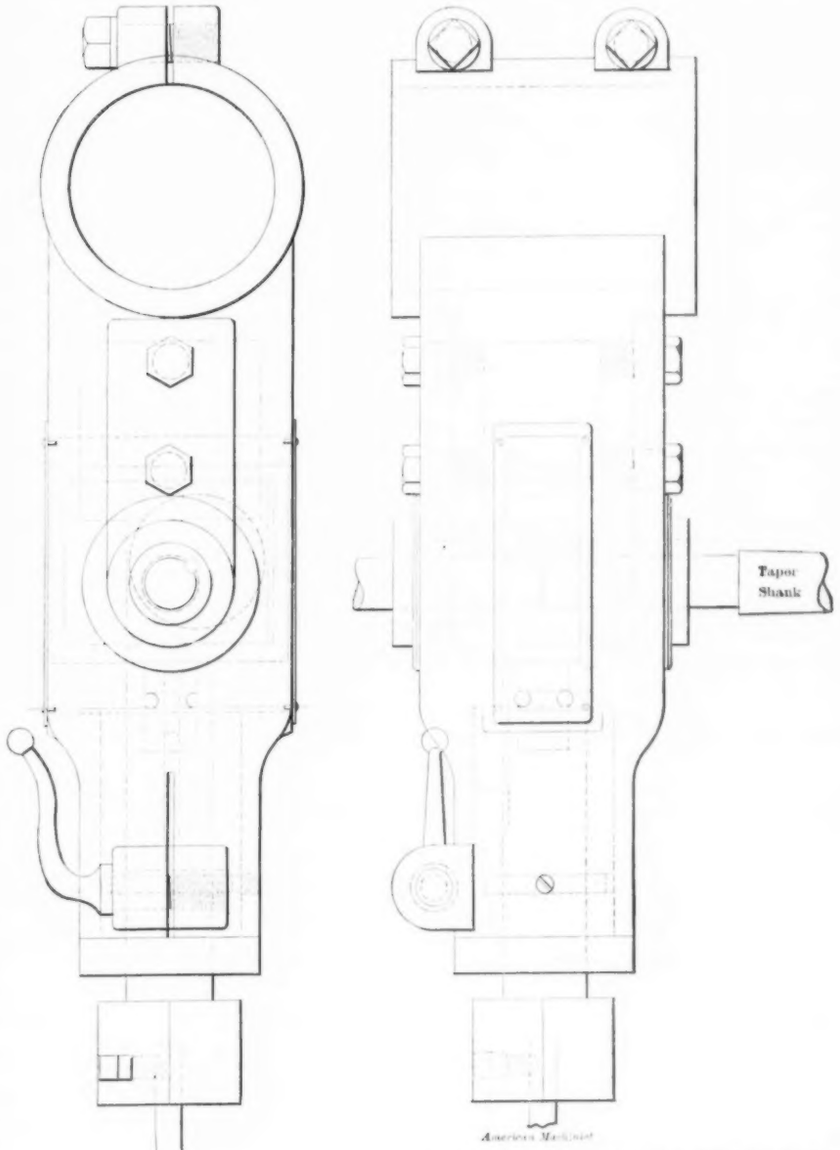


FIG. 2. VERTICAL SHAPER ATTACHMENT FOR MILLING MACHINES.

"In reply to your favor of the 10th inst., we are pleased to give you list of the books which we think would be of interest to those of your readers who wish to know more about astronomical instruments: 'A Text Book of General Astronomy,' by Prof. C. A. Young (Ginn & Co.); 'A New Astronomy for Begin-

ners,' by Prof. David P. Todd (American Book Company); 'Stars and Telescopes,' by Prof. David P. Todd (Little, Brown & Co.).

"The last two named books would prob-

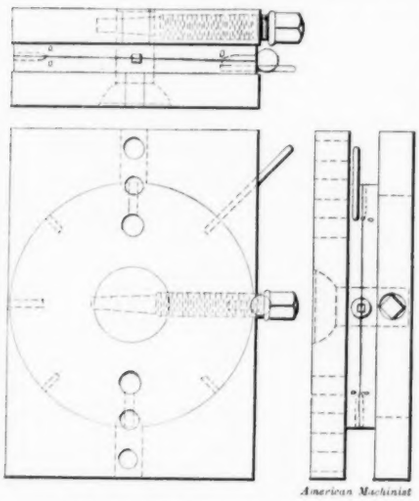


FIG. 3. THE TILTING CHUCK.

ably be best for those who are just becoming interested in astronomy and instruments pertaining to it.

"WARNER & SWASEY."

Letters from Practical Men

Places Where Lock-Nuts Lock.

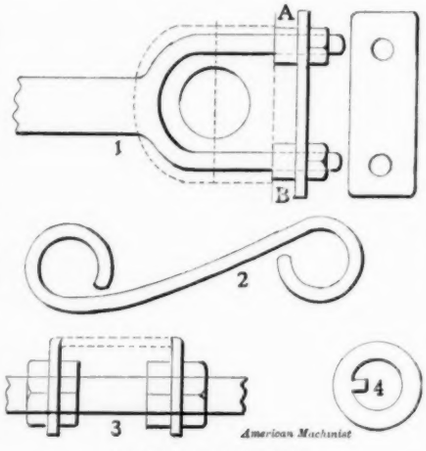
Editor American Machinist:

Mr. Swift's article in your issue No. 10 causes me to think of some places where lock nuts *lock*. Some makes of mowing machines use on their pitman a device which is effectual in holding the boxes just where they are placed, and in all my experience I have never known them to fail. Fig. 1 shows the method—simply a single plate with two holes in it between the nuts. One can with his fingers screw the nuts *A* and *B* to hold the boxes properly and then with a wrench lock them with the outside nuts. There is no turning of the ones which hold the boxes. If the rods break, it is by screwing the outside nuts too hard, and they break between the nuts and give the farmer one chance of rivetting the ends to hold the first nuts on.

The Lehigh Valley Railroad uses with the nuts that hold the fish-plate bolts a wire bent as Fig. 2 between them—not, as I understand it, to help hold the first nut tighter against the fish-plate, but to hold it in a certain place on the bolt and to keep it from backing off.

In my own practice for valve rods, where nuts are used to adjust and move the valves, I devise some way of putting a plate between the nuts, as in Fig. 3. It is easy in some places to bend a piece to straddle over the inside nuts and serve the useful purpose, as shown by dotted lines on Fig. 3. Wherever such a piece can be used, and it almost always can be, one needs but one wrench in locking valve-rod nuts, and they can be locked to *lock*. An eccentric strap is always a bothersome thing to get just right, especially on an old engine, and if a body can run one set of nuts up where they make the strap just right, and lock them right there with another set *dead sure*, there is a lot of time and bothersome packing saved, and I can generally find some way to get a plate between the nuts; that does the business. In the first place the bolt must be fixed so it will not turn in the hole nor the plate turn on the bolt. In bicycle practice some makers cut a slot in the bolt and slip on a washer like Fig. 4, but the nut is not strong enough for settled business. Some flat one side of the bolt and use a washer with a D-shaped hole. Neither of these two ways make a secure job, but admit of a washer with a finished appearance.

As to bolts on main engine bearings, perhaps a spectacle-shaped plate might be an innovation between the nuts and look awkward at first, but it would do just what needs to be done: hold the first nut where it was placed. In all of the examples which I have mentioned, the nuts are supposed to all be of equal thickness, except on the main bearing boxes. I can



NUT-LOCKING DEVICES.

see no reason why they should or should not be on. Lock nuts *do* lock in places, but in places they are a scourge to get off, only as you hack them out of shape with that indispensable tool—a cold chisel. Yesterday, I found a place where, if there had been two nuts instead of one, I could have blessed the man who put them on. It was on the bolt of a hand hole plate in the smokestack end of a locomotive boiler, where the bolt was a half-inch too long, and the ashes and soot had corroded the end and deposited scale which made an effectual nut lock. If there had been another nut to cover that bare end, I would have felt good toward the man who put it on.

In regard to a bolt through a stub end and strap, of which Mr. Swift writes, I can see no use of the second nut where the first one screws down against solid iron where there is no slip of the parts expected. With the fish-plate and rail, it is expected the joint between will slip.

Tunkhannock, Pa. F. P. AVERY.

How Does a Check Nut Work?

Editor American Machinist:

Referring to the letter, "How Does a Check Nut Work?" by Mr. Tecumseh Swift, in your issue No. 10, 1901, it would appear that Mr. Swift has omitted in his discussion one of the fundamental principles in the action of a check nut, namely, that the office of a check nut is to prevent the main nut from turning *when the load is removed or diminished*.

A nut carrying a constant load does not tend to unscrew and become loose, for its friction, and consequently the force required to turn it, remains unchanged; but when the load is removed, the friction due to the load is also removed, and the nut is free to turn, except for the comparatively small initial friction between the nut and the bolt threads. The office of the check-nut is to keep a continual pressure against the main nut, whether the load is being carried or not; and thus prevent periodic removals or variations of the load, such as may be produced by vibrations, inertia effects and other causes, from relieving the pressure against the main nut. The check nut should first be put on and screwed up, then the main nut screwed against the check-nut *until it takes the* load; then by means of a spanner the check-nut should be screwed *back against the main nut* until its threads bear on the *opposite side of the bolt's threads* from the main nut. With the nuts in this condition the removal of the load does not relieve the pressure on the main nut.

If the clearance between the threads of the nuts and bolt is small and the body of the bolt is long, or the pieces held together are very compressible, it is possible for the bolt to stretch or the pieces to compress enough, when the main nut is screwed up, to cause the check nut to bear on the opposite side of the bolt threads from the main nut and then jam without any screwing back of the check nut being required; but it is essential that the check nut shall bear on the opposite side of the bolt threads, otherwise the removal of the load will make both nuts loose, especially when the thread clearance is large.

J. J. C.

When a Check Nut Checks.

Editor American Machinist:

I suppose that by this time the readers of the "American Machinist" care to hear little more about check nuts, but if you will allow me I would reply to the interrogation as propounded by our friend, Mr. Tecumseh Swift, in the closing sentence of his article on this much-discussed subject. Laying 1,000-pound weights and all theoretical matter aside for the time being,

let us look at the subject from an extremely practical point of view, and in order to do so I will give an illustration which I think answers the question he asks.

In the anthracite coal regions of Pennsylvania there are many very deep mines, as many of the readers of this paper are aware, and in almost all of them water is one of the greatest sources of trouble, and, I might say, danger. To keep this water under control, steam pumps of large capacity are installed, and during the rainy season these pumps are taxed to their utmost capacity, and the generally accepted standard of 100 feet piston speed per minute becomes, more or less, a forgotten quantity. Under these conditions the most reasonable thing to expect is a breakdown of some kind, and those in charge are, as a rule, not disappointed, for it frequently happens; and, ignoring the conditions, they lay the blame at the feet of hard luck, fate, or some other unknown agency. One of the most common forms of accidents in this connection is the parting company of the pump or piston rod and the plunger, which, as a matter of course, allows the pump end to stand still and the steam end to go on at a mile-a-minute gait, with apparently enough energy back of it to send the piston out through the back head, through the intervening strata of coal, slate, rock, etc., finally striking off at a tangent to the earth's surface into endless space.

In the particular instance of which I write, the pump had a plunger 18 inches diameter and 6 feet stroke. The pump or piston rod was 4 inches diameter, was in one piece (which, by the way, is bad practice), with the steam piston on one end and the plunger cap on the other. A common practice of fastening these plunger caps on the rod is, to turn the rod taper to fit a reamed taper hole in the cap, grind it to make it water-tight, and then drive the cap into place. It is held there by two nuts, screwed on the end of the rod. The plunger cap is fastened to the plunger by cap screws, and in this instance ten of 1⅛ inches diameter answered the purpose.

Under conditions somewhat like those stated above, the pump was running at a high speed, and notwithstanding the fact that it was delivering between 3,000 and 4,000 gallons per minute, the water was slowly gaining on it, and had already reached the level of the rail, when the piston rod and the plunger agreed to disagree and parted company, dividing the assets between them, the plunger retaining the outer flange of the cap and the cap screws; the rod taking for its share the hub or center and the nuts.

The pump house in a mine is generally raised about 3 feet above the level of the gangway, and is no larger than is absolutely necessary, consequently the opportunities for moving about are not very great, and for doing work are less still. The pump runner took in the situation at a glance, having no doubt been there before, and immediately summoned the "chain gang" (the name given to the men who repair the machinery inside the mine). The only way to get at the pump rod was through a door in the side of the clack, and on this size pump this door is about 14x24 inches, and all the work required to perform the necessary repairs had to be done through this opening.

If there is one set of men more than another who daily meet and overcome obstacles of this character, of a necessity in the shortest possible time, it is the chain gang in the anthracite coal mines. The object in this instance is obvious—the removal of the nuts and the placing of a new plunger cap. But all their persuasive arguments in the form of methods used heretofore proved futile. That check nut would not move, and the water continued to rise. Imagine yourself, if you can, down some 800 feet below the earth's surface, in almost pitch darkness, with only the flicker of a safety lamp, and that hid under a bushel, as it were, to illumine the gloom, the water in the gangway rising slowly but surely in a nerve-destroying manner—not nerve-destroying from the standpoint of human timidity, but when the consequences that will result if that pump fails to move in a very little while are considered. Now and again is heard the last despairing screech of a rapidly fleeing rat, which in its vain attempt to reach a place of safety, fails in the attempt and falls into a watery grave, emphasizing the fact that the water is rising. Having with you constantly the thought that upon you rests the responsibility of the saving or the drowning out of that mine, which means the making or the losing of some $600,000; and you will have impressed upon your mind most forcibly indeed when a check nut checks—checks in the correct sense of the term, in that it refuses to come off; checks the egotism of the man who knew how to get it off—in fact, checks everything, with one exception, and that is the rising water.

There is more truth than poetry in the above, and had you been the one in charge of that mine as the water slowly rose to the level of the pump room and flowed in about your feet, I need hardly add that it would have been more dangerous than profitable to have asked you at that moment: "If a check nut checks when does it check?" MAC.

Montreal, Canada.

How the Check Nut Checks.

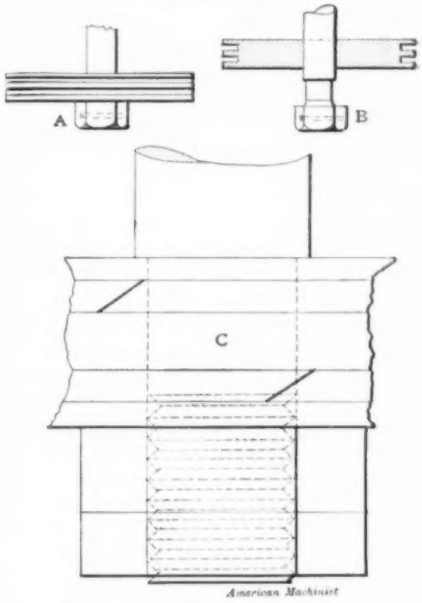
Editor American Machinist:

I have watched the check nut with interest. I would say that the large nut should go on first, and all the load or strain should fall on that nut. The smaller nut is placed on merely to hold the first nut in place, to keep it from turning, and when it is screwed up against the first nut it not only has a tendency to distort the thread, but also stretches the bolt; and the first nut, when it has a tendency to screw off, not only has to push against the small nut with considerable force, but has to cut the first thread between the nuts, as the small nut when screwed up pulls the threads apart. It will have to cut, as you might say, crossways of this thread. Of course this depends on how tight the small nut is pulled. One of the leading firms of Cleveland, the Brown Hoisting & Conveying Machine Company, mill their check nuts on the face to an angle of 5 degrees; so you can readily see that when one of them is screwed up, it has a greater tendency to distort the thread between the two nuts, by upsetting the thread and bending the bolt; and if that is not a case of checking the nut, I have missed my guess. C. G. F.

The Check Nut Does Check.

Editor American Machinist:

On page 267 of the "American Machinist" I notice that a gentleman is greatly disturbed by what to him seems the doubtful utility and the unmechanicality of the



THE CHECK NUT DOES CHECK.

check nut. He would ridicule and malign this most useful member of the mechanical world by attempting to show some synonymity of the words check nut and chestnut. I protest against this abuse of the check nut and will give my reasons for so doing.

Where he states that the jammer nut does not really contribute a pound of any additional pressure or any resulting amount of additional friction to the nut jammed, his statement is simply erroneous. My experience with the check nut proved to my entire satisfaction that when the nuts are properly proportioned and correctly made the jammer, or outside nut, does give increased pressure and additional friction to the jammed nut and constitutes a true check nut. Then where

an attempt is made to show that the inner nut is but a washer, it shows only that the nuts the gentleman is so familiar with were not well made. The inner nut, when properly proportioned and applied with intelligence, bears but little resemblance to a washer. Were the nuts quite loose on the threads, one might then be likened to a washer, but to give good results and to obtain positive checking value, the nuts must have good fits on the threads, a condition easily obtained with our improved methods of manufacturing. In the case of connecting-rod straps the larger and general evidence goes substantially to prove service efficiently rendered.

The check nut has caused me a great deal of study in a certain line of work. I was early led to believe that the check nut was to be distrusted and that it could have no justifiable application at all. The securing of a perfect check was a highly important one for the continued and proper operation of the air pump of the locomotive, which was in my line of work. The problem was as to the proper manner of securing the piston rod of the air pump to the air piston head. The manufacturer of the air pump no doubt figured to construct all parts with a minimum of material that should stand the service expected. Our first experience was with a single nut, as shown at *A*, a standard one-inch nut blank tapped 10 threads per inch. The piston rod was fitted to the head in first-class style and the nut was screwed up tight, but with judgment, and the pump was placed in service. It was impossible to keep the piston on the rod, as the nut persisted in leaving the company of the head. Then we drilled through the nut and rod for an $\frac{1}{8}$-inch pin, as shown in dotted lines. This plan served admirably for preventing the nut from coming off, and that is about all that it would do. The nuts were not tight enough in the first place. There would be a little give and then wear would commence on the shoulders of piston rod and on the air head, and finally, if not remedied in time, the piston rod would find its way clear through the piston, as at *B*.

Then we tried two nuts as shown at *C*, the inner nut 9-16 inch thick, and the outside one 7-16 inch, faced flat and true and the corners not relieved. The inner nut was set up tightly, probably with about the same pressure as was applied to the 1-inch nut first used. Then the outer nut was set to nearly the same pressure, and these nuts never came loose nor allowed the head to find the slightest movement, though the nuts were frequently drenched with oil, they carried an excessive amount of pressure over what would be considered a safe load, and they suffered a terrible amount of jar. Should you examine closely the sketch *C*, showing the piston rod shoulder, you may be able to appreciate to some degree the source of all our troubles. The pressure in the cylinder frequently went to 120 pounds, giving a pressure on the nuts of over 5,300 pounds, and this transferred from side to side at the rate of 50 to 80 strokes per minute.

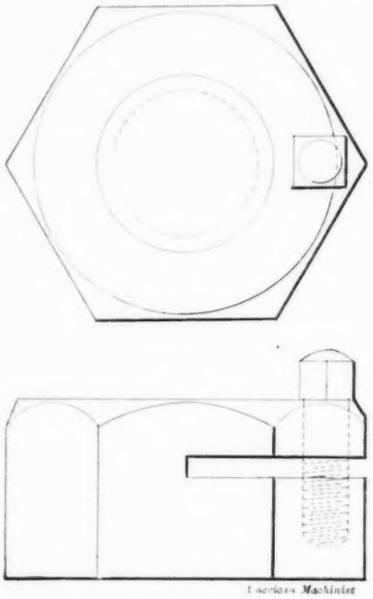
The experience gained by me in this line of work gave me utmost faith in the perfect adaptability of the check nut in the place here mentioned. The theory of action of the check nut to me is not doubtful or mysterious. The inner nut, being preferably made the thicker one, when screwed up tightly, takes a positive load; then setting up the outer or thinner nut, which is the jammer, gives additional tension to the end of the piston rod, thereby grasping the piston head tighter. Many would claim that when we have increased tension on the rod the inner nut then becomes but a washer, but I found that such was not at all the condition of the inner nut. In setting up the inner nut it expands, and then when the outer nut causes increased tension on rod, the inner nut closes, so that its thread surfaces are in perfect contact with those of the piston rod, thereby making it carry its own proper portion of the total load. The outer nut when tightly set suffers minute abrasions of the nut and thread faces; this is the source of the checking power of the check nut. This checking cannot be obtained by placing the thick nut outside. I cannot believe otherwise than that the check nut does check.

FRANK RATTEK.

A Lock Nut.

Editor American Machinist:

As your valued contributor, Mr. Tecumseh Swift has started about lock nuts, I am reminded about one I saw first in use



A LOCK NUT.

in the Woolwich Arsenal, England. I enclose a sketch, which nearly explains itself. The slot is milled halfway through the nut, the width of slot being equal to the pitch of the thread. I have found it most satisfactory in nuts over $\frac{3}{4}$ inch diameter, and as I have worked in several parts of America and have never seen one used unless I introduced it myself, I thought that, for the benefit of the younger class of your readers, I would submit it for their consideration.

M. H. WESTBROOK.

A Leak in the Suction Pipe.

Editor American Machinist:

Having been a constant subscriber of the "American Machinist" since it started and having read the experiences of several mechanics in difficulties, and more especially "Osborne," I will give you one I had in connection with a set of pumps which supplied water to our little city. I had occasion to shut down the pumps for a short time, owing to repairs being made at the dam. The water was lowered in the river about 10 feet where we took the supply to the pumps. The suction pipe extended into the river 450 feet—50 feet of 12-inch cast-iron pipe and 400 feet of 14-inch wooden tube. I had the suction pipe examined and found all the parts which I could get at in order. The outer end of the tube was 12 feet under water, and a box 24 inches square came up 6 feet from the tube with a screen on top $\frac{1}{4}$ inch mesh.

The pumps were working first class when I shut down with the reservoir full. When the repairs were completed at the dam, the water was let down to fill it. The water came up over the iron pipe 3 feet and over the outer end of the suction 16 feet, so that I had plenty of water over the suction pipe. The pumps were in a building 1,200 feet from the river and 9 feet lower than the water in the river, which made every chance for a good siphon. When everything was filled up I started up the pumps, thinking what a nice run they would have after seeing that the suction pipe was in such good order; but after a few minutes' run the water left the pumps. I filled the suction pipe and started again, with the same result. I imagined at once that something had got on to the screen. I tried my hand on a valve on the suction pipe; it did not pull so strong as I wished. I had all the valves on the pumps and also the pistons examined; everything was right. I got a diving suit and examined the screen; found it all right. I then had 2-inch holes bored in the tube near the iron pipe, but with no better results. I had the men dig at several points along the pipe leading to the pumps and bored small holes to see if there was water. I found the water came up. I came to one part where the pipe was higher than the water in the river. I had the pipe broken and a plug put in on the pump side, and put on the water pressure from the reservoir. I found the pipe leaking where it had been broken when digging to put in a sewer by

some men, between the time of shutting down and starting, just a little nearer the pumps than the highest part of the suction. And I had worked and bothered over that little thing for five days.

It was a hard experience for me, seeing that reservoir going down and being unable to get water through, and so many giving advice and opinion about the trouble. It was one of those cases where a man has to think hard and sleep little.

A. SANGSTER.

Sherbrooke, Canada.

A Machine Shop on Wheels.

Editor American Machinist:

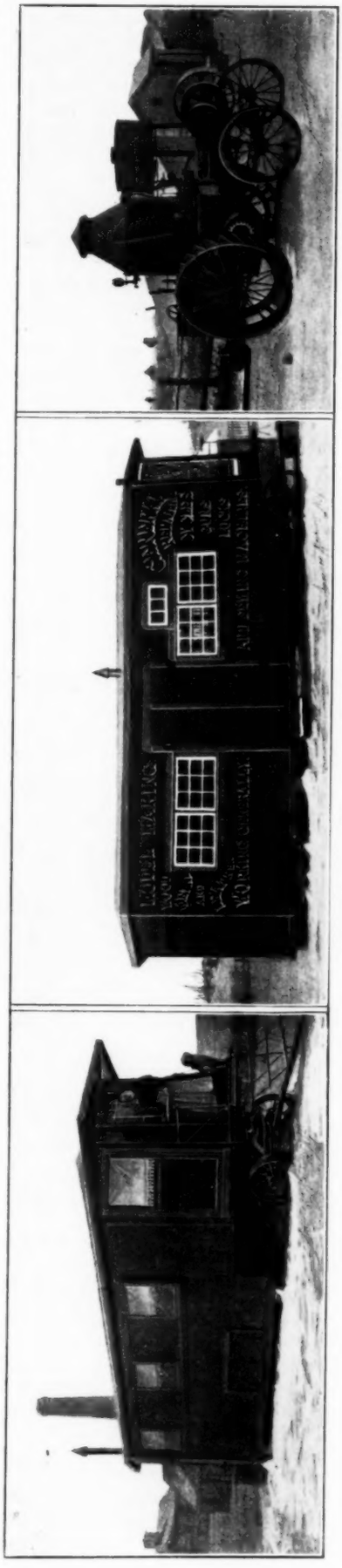
A novel, interesting and prosperous machine shop is located just now in Walden, Orange county, N. Y. It consists of a 10 horse-power Westinghouse traction engine and two cars, each 10 feet high, 10 feet wide and 25 feet long, called respectively machine car and living car.

THE BOSS OF THE TRAVELING SHOP.

The machine car is fitted up as a shop and each machine can be operated by either foot-power, horse-power or steam power. The machines comprise a 9x36-inch Star, ball bearing, taper attachment, automatic cross-feed, screw-cutting lathe; a 12x12x26 inch planer, a polishing lathe, buffer, drill press, grindstone, blacksmith forge, a jeweler's lathe and outfit, a set of cabinetmakers' tools, melting furnace for iron, brass and copper, flasks for molding, wheelwright's outfit, horseshoer's tools and drills, taps, wrenches, files, chisels and small tools of every description.

A tread horse-power machine furnishes horse-power. This car with its full equipment weighs over four tons, and also has a roof hinged on one side of the car, with canvas side and ends forming a stable for the horse when encamped, and which can be folded up against the side of the car when en route.

The tools are all modern, many of them having been made by Mr. Glen Wickes.



ENTIRE EQUIPMENT OF THE TRAVELING SHOP.

the proprietor, and they are conveniently arranged. On my first visit to the shop, the forge attracted my attention. It being a very cold day, all the doors and windows were closed. Glen Wickes had just made a fresh fire, in which he had a good-sized bar of iron heating and, although there are no ventilators in the roof or sides, there was little smoke or dust inside the car. This was accomplished by placing a hood over the fire with downward projecting sides. This hood hinged at the lower end above an opening about 2x6 inches in the pipe from the upper blast, completely drawing off all smoke and dust and expelling it through the smoke pipe.

Glen Wickes' history is a most interesting one. Born in Pike County, Pa., with only three winter terms, of three months each, at a country school, and starting to work when twelve years of age at harness making. Here he worked two years; leaving that, for two years more at boot and shoe making; after that, one year at blacksmithing, wheelwright, horseshoeing and sign-painting; then two years and a half in a machine shop at general repair work; next, six months with a gunsmith, and finally starting in a little shop in Walden, four years ago—until he had built his first car, two years ago. He has been able to do, up to the present time, any job which has presented itself, without any outside help. This establishment has been produced without any capital except what he has earned, and he has built these cars, furnished and equipped them, while earning it.

The second, or living car, as Glen calls it, is divided into two parts—a sleeping and sitting-room and a kitchen. The sitting-room has folding beds, a desk, bookcase, table, with several chairs, several pictures on the walls, oil paintings—one of his boyhood home in Pennsylvania, and the other his first shop in the mountains in Pike County, painted by himself. This room is 10x15 feet. In the kitchen they have a range, china closet, ice-chest and every convenience for cooking. The whole makes a very comfortable home for his mother and himself.

Knowing that very few small places have a well-equipped machine shop, Glen hit upon this plan of building one, so that they might travel and locate themselves where business would be good, or could move on where there might be more demand for his various occupations. His plan is to travel Southwest as far as Mexico. He has been very successful in Walden, made quite a reputation for himself, and has all the work he can do; but he says the camp will move just as soon as the roads are in good shape. The engine will pull both cars up any hill around Walden, and it is quite a sight to see his train moving along.

Although he is only twenty-five years of age, it shows what a young man with grit and honest methods can accomplish.

even without capital and little or no education. He has just paid $1,000 for his engine, and intends adding more machinery to his outfit.

GEORGE D. CAMPBELL.

The Practical Limitations of the Micrometer.

Editor American Machinist:

A question has been in my mind for some time as to whether the micrometer's introduction, generally, in our shops promotes good work and good workmen. That the micrometer is a good thing and that it has in many cases superseded to advantage the caliper and scale is apparent to all. In erecting it is very handy, and to the inspector it is a necessity—saves time in hunting up a cartload of gages. But what I want to speak of particularly is where we have "too much of a good thing."

Take, for instance, a shop which I have in mind, a really up-to-date shop in every particular, where newcomers are asked if they can use a micrometer and where some of the foremen teach the apprentices to rely upon the micrometer caliper for most of their measurements. On lathe and screw-machine work, duplicate work, supposed to be interchangeable, the "mikes" are set and shoved over the work so that in assembling the machines these parts cause all kinds of trouble. Nor is this all. As a result of such treatment, the "mikes" are so badly sprung that they are practically useless. The apprentice who has not been first taught the use of a pair of calipers doesn't need a micrometer. The micrometer can be used to make a sample piece and then from that the other pieces should be made, using an ordinary pair of calipers. They're not so costly or delicate as the "mikes." CHEROOT.

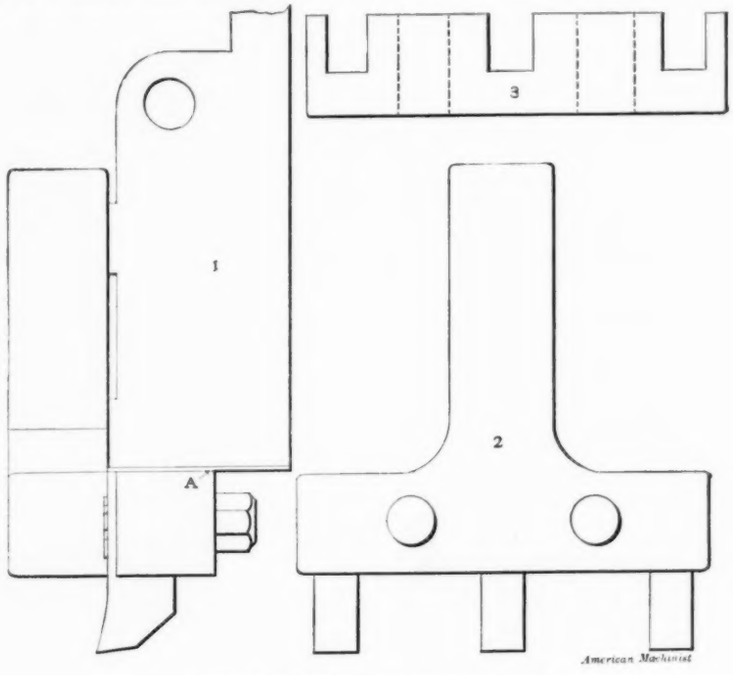
A Triple Square-nose Hogging Tool.

Editor American Machinist:

That a good square-nose tool has about all it can do when it is removing about one-fourth, or less, metal than a roughing tool, I don't think anyone will doubt. Still, the only apparent advantage of the roughing tool is that it may have rake in two directions, while the square-nose has rake in but one, which should make it 2 to 1 in favor of the rougher, instead of 4 to 1, as above stated. It does seem strange, though, that we see it and know it, but yet don't know why it is. In cutting a slot, the tool will throw the chip to one side or the other and cause some strain. The tool will also cut somewhat larger than itself.

In the sketch is a triple square-nose tool, for roughing out the T-slots in milling-machine tables, cast solid, allowing just a light finish on the sides. The "L" part of the slot is milled out easily later. A pair of these triple tools are used on a double-head planer with a variable speed shaft, and the planer is slowed down a little. To see six ⅝-inch tools going down in six slots at once, with a good stiff feed, is quite interesting, because it gives the planer one of those low, tugging-about-all-it-can-do sounds, and you will wait for something to happen. Still, each tool itself appears to cut freely enough. These tools, if not altogether a novelty as gang tools, are, I think, new in being a spring-back gang tool, and I claim them as original, without any patent.

Fig. 1 is a view showing the clamp *A* set hard against the tool-block, which we found prevented the two ¾-inch steel screws from bursting off under the strain of a cut. Fig. 2 is a front view of the tool, and Fig. 3 shows how the clamp *A* is



A TRIPLE SQUARE-NOSED HOGGING TOOL.

planed out to fit the three Mushet, square-nose tools. The tools are shown as used at the shops of the K. K. Le Blond Machine Tool Company, Cincinnati, O.

H. L. CAMERON.

A Skiving Box Tool for the Screw Machine.

Editor American Machinist:

I send you drawings of a tool that we call a skiving box tool. It is for making the piece *A*, Fig. 2. The method formerly in use was to make it on the screw machine in the ordinary way, leaving some to finish on the outside. The pieces were then put on a hardened and ground mandrel and turned with a single-point tool, and as they had to be to gage, and true, it was a slow and costly job; so the tool here shown was designed to make them and finish them on the screw machine; and it is a success.

This tool (that is, the original idea of passing the tool over the work with the tool held in the turret) was designed by Mr. C. P. Colburn. As first made, it did a first-class job in every respect; but it was quite costly to make, and had some objectionable features. A number of changes were made, and the drawings show, complete and in detail, what finally came of it. The main piece *B* is made the full width shown, and is then milled 1⅞ inches wide and of a hight to suit the diameter of the piece to be made—in this case 1 5-32 inches. In making this piece, the taper hole for the plug *D* is first drilled and reamed. It is then put on a mandrel and turned on the shank and faced on the ends, giving a good square face to mill the edges to. The inside of *H* is then milled out 1⅞ inches wide; the hardened pieces *G* are made and put together and clamped between faces of *B* and *H*. The screw holes are drilled and tapped, the pin holes drilled and reamed, and there you are. You have a good fit, square with the shank, and no very fine work about it.

This tool is very handy to grind, as, when that is necessary, all you have to do is to throw the lever clear up, pull out the tool, grind it on the end and put it back; this changes nothing. I find that when once set up, it will keep right on making pieces to gage until worn out, no matter how many times it is taken out of the turret.

The assembled drawing shows that some other tool has been used on the piece before the finishing tool. A formed tool is used on the cross-slide for roughing the outside and for finishing the boss on the side, leaving .005 inch for finishing the tool to take off the outside and corners. This finishing tool will not work satisfac-

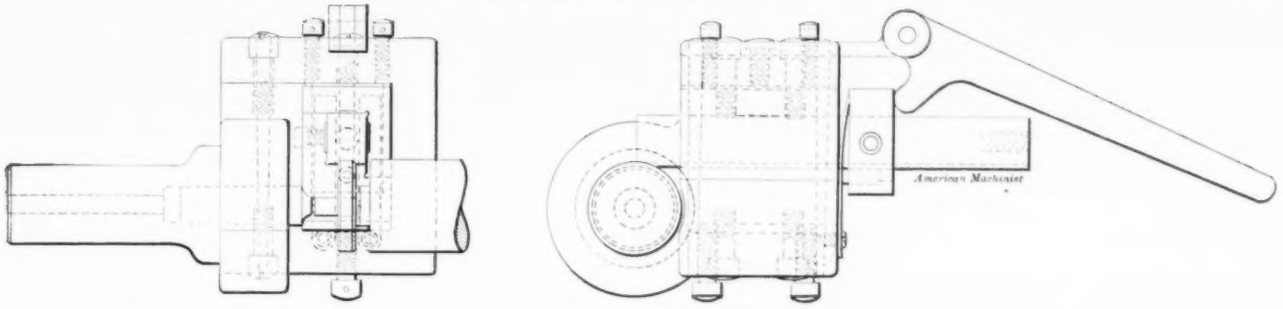


FIG. 1. SKIVING BOX TOOL FOR SCREW MACHINES.

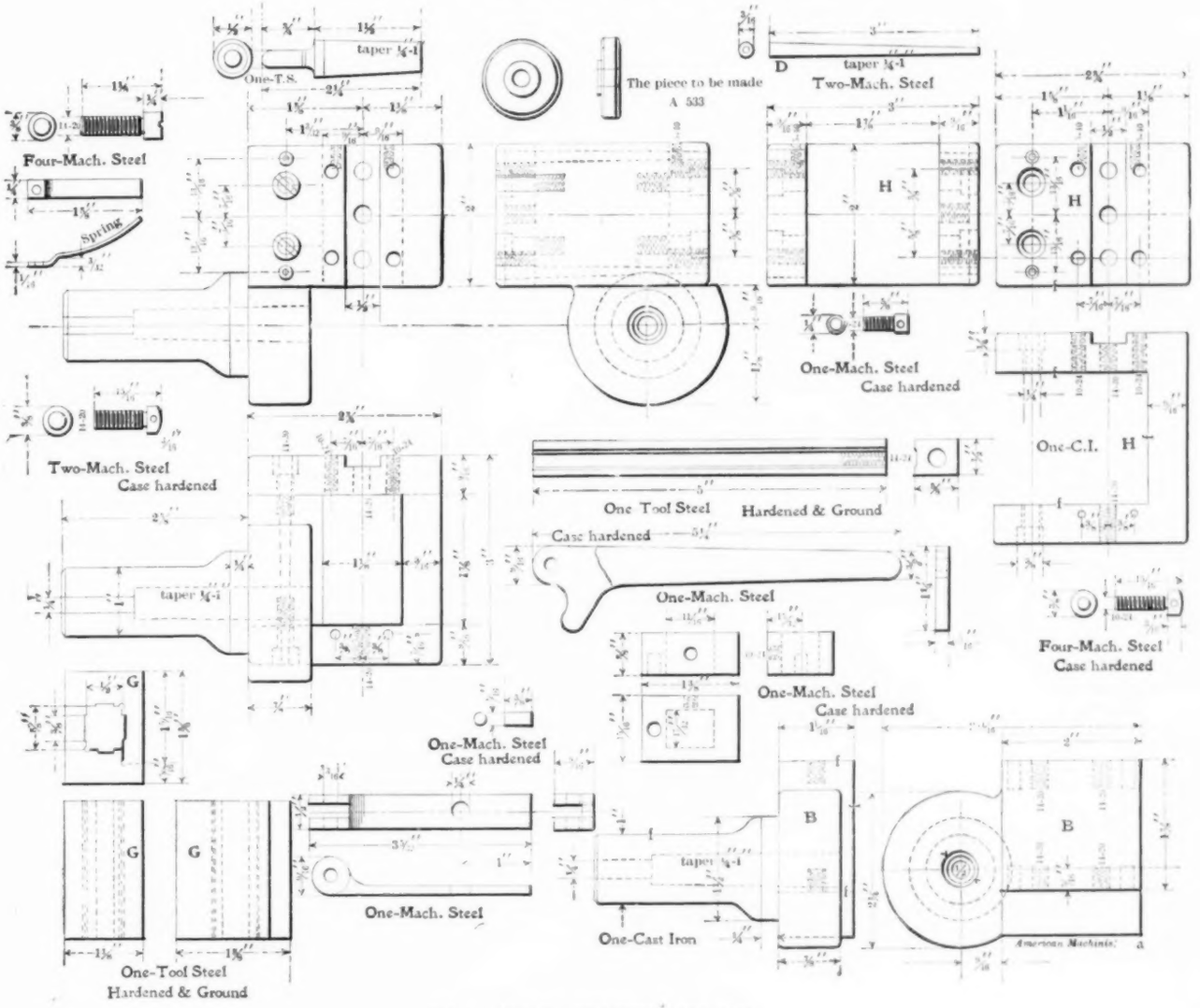


FIG. 2. DETAILS OF SKIVING BOX TOOL.

torily if too much is left for a finish cut. The formed tool also makes a way for the cutting-off tool down to the diameter of the boss. In operation the lever is pulled down until it stops, and is then let go, and it takes care of itself. ROLL HOLDING.

[Fig. 2, giving every detail of this tool, is reproduced from the shop drawing.—Ed.]

Keying Crank Boxes.

Editor American Machinist:

For several years it has been the practice with the chief engineer of a large Chicago isolated electric plant to have the crank-pins keyed so tight that a man pulling at the free wrist end of the rod could not move it about its crank-end bearings.

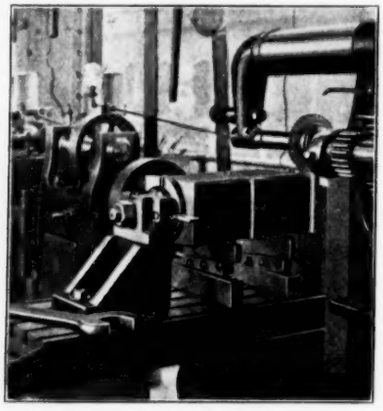
The engines are vertical cross-compound of 200 horse-power each, running at 275 revolutions per minute. The crank boxes are lined with soft metal which pounded itself to a loose fit in about one week's run. Gradually the boxes were keyed tighter and tighter until finally the keys were driven in hard with a heavy hammer and then not loosened as is ordinarily done, but were left tight. With this sort of adjustment the engines run for months without requiring attention at the crank, and it may be needless to say that they run without hammering; indeed, they are probably as quiet running engines as you would meet in a day's walk. Oil is fed in a stream to all bearings, and is then pumped in the usual way to a filter. A peculiarity of this adjustment is that in starting the engine it should be done in as short a time as possible, since the excessive pressure forces the oil out from between the bearing surfaces and causes the box to heat, but when once up to

speed the film of oil stays in and there is no trouble. The wrist-pin is keyed in a similar way but probably not quite as tight as is the crank-pin. FRED. A. KREHBIEL.

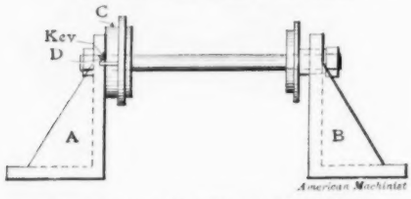
Rig for Cutting Boxes in Two.

Editor American Machinist:

The fixture here shown is for cutting connecting-rod boxes in two on the milling machine. It is double-acting, in that it is also a cost cutter where the operation has previously been done on shaper or planer. It is usually considered a much cheaper way to make these boxes in one piece, and then, after the box is bored, faced and planed, or rather milled, to cut it in two as the finishing operation. This device will hold all sizes from 1¾-inch bore to 10 inches, or larger if the angle pieces on each end of the holding mandrel are made higher. The only thing necessary in changing from one size to the next is a pair of cast-iron washers with hub to fit bore of the box. The holding mandrel has a collar *C*, which is indexed and held in position by a key *D*, so that after the box is cut on one side, the key is drawn and the mandrel holding the boxes is turned half-way round and the key put in place again, when the other side is ready to cut. The saws are set wide enough apart to cut out the desired amount for liners. This fixture is shown holding two boxes for cutting at once, and it is considered by our company as an up-to-date way of doing this work.



CUTTING TWO BOXES IN TWO.



RIG FOR HOLDING BOXES TO BE CUT.

A. A. AVERY.

The Use of Micrometer Calipers for Regular Machine Shop Gages.

Editor American Machinist:

In the early days of the machinist business, there were no means at hand for working closely to any standard of dimensions, and very little effort was made beyond the making of different parts to fit each other. Some people may think it impossible to make work interchangeable in this way, but of course there is a way to do it. It has been done quite successfully by first constructing a successful machine, as a model, then taking it down and using its separate parts as standards. This plan works fairly well for a single shop, until there is a fire. When it comes to some other shop duplicating work, or making repairs, the system does not work so well. In the earlier days some very short-sighted persons thought this plan would work to their own advantage by forcing people to go to them for all repairs. Clearer headed people see, with modern means of measuring, that a hole approximately one inch might better be near enough to fit a standard arbor or reamer, and that a tap 1-64 inch over half-inch in diameter might as well be half-inch, near enough to agree with some other fellow's tap, and that such things must make their machinery more valuable and lead to further orders from satisfied customers. The advantage of following our standard of inches is that it is a means by which we can talk intelligently and order intelligently. Everyone knows what an inch is in theory. When I say make work 1 inch in diameter, I do not mean the theoretical but the practical, the near enough for the purpose, near enough to fit the standard arbor, or some other fellow's arbor. This limit may be .001 inch more or less. It is not difficult or expensive to reach this, using modern appliances. I have heard it said, not long ago, that the best modern mechanics are not the ones who have "good enough" for their motto. The modern or the ancient mechanic who does not or who did not have "good enough" for his motto is a very poor "stick," a man whom no machine shop can afford to have around; in fact, he is no mechanic at all. A mechanic undertakes to construct a machine to fulfill certain conditions, and if he continues to monkey with it one minute after it fulfills these conditions properly, he is wasting money. This "good enough" cuts a big figure in the standard measurement business. It is the connecting link between Success with a big S, and failure. I have seen machine shops, in their endeavors to adopt standard sizes, act very foolishly and waste considerable money, merely because they did not grasp this "good enough" idea.

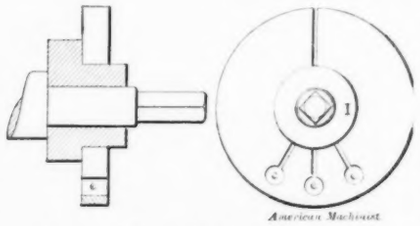


FIG. 1. GRADUATED DISKS TO SLIP ON.

This "good enough" is not something to be guessed at; it is something to be measured, something to be dealt with intelligently. It is our *allowable limit*, our measure of how far the work can vary from standard and still be used successfully. This allowable limit enters into all classes of work. In some cases in navigation it may be a matter of ten or fifteen miles, and in fine gage work it may mean .0001 inch or less, but the limit must exist just the same. We must have some means of knowing when work is near enough if we want to do business and live. When we use a solid gage or a snap gage, it stands for the size in theory all right. It answers one question: Is the work theoretically correct? If too large, make it smaller; but what about too small? Perhaps it will go, if we had something to tell how small it is. Perhaps you have limit gages, two sizes, to go through, and not to go through. This is much better, you know, than whether to throw the work away or not. The limit gage can

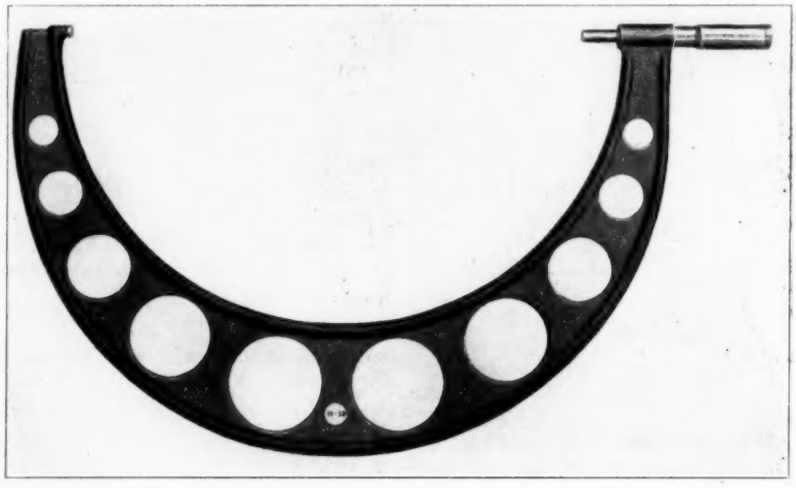


FIG. 2. A 12-INCH MICOMETER CALIPER.

be made to answer the final question: Will we save it or throw it away?

Now, this same limit-gage business is very complicated, and it is also expensive, when carried out to the extent necessary to get anywhere with it. It does not, and cannot, answer all questions. You give a man a limit gage to turn a piece of work to. He says, "This piece is a certain size now; if I know what size it is, I can form an idea of how much there is to come off." This is worth knowing. He wants some means of measuring the piece just as it stands. The fellow who ignores "Good enough" doesn't care. He will start nibbling that piece up into atoms. It won't do to take a big chip, for fear of getting it too small. You must have patience with him. The mechanic of to-day wants a means of measuring his work during the process of finding the right size.

The micrometer caliper with graduated dies on machines fulfills the requirements quite well. I do not mean to say buy a lot of them and throw them into the shop, and that then things will right away start off like a summer night's dream. This would be too much to expect of even a good thing. There are some brains required along with them. I have never seen a machinist who after undertaking the use of a micrometer was not improved by it in many ways. His "littles" soon come to be expressed more intelligently. He commences to measure, where he formerly guessed, with a consequent improvement all around. A shop is improved by introducing micrometers even on a small scale. Jones says they are too expensive, but it seems that Jones has not figured very accurately. If he figures what limit gages will cost, to do even a small part of what the micrometer will, he will find the micrometer a very cheap tool in comparison. Then, again, the demand has much to do with the cost. If micrometers were used to the extent that they should be, there would be a demand for hundreds of times more than at present, and this would naturally reduce the price. Smith says the greatest trouble is that they are too light and tender, too liable to get out of order, in the hands of all classes of help. Smith's ideas are the most common. Probably there are some differences in makes, but it makes a great difference how they are handled. In the snap gage, there is no provision to show how large a piece is until the gage goes over. Most machinists want earlier information, and so they force the gages, in hope to tell, by the sense of touch, how much remains to come off. This sense of touch differs in people very much. In some it amounts to all their strength, and these strong ones spoil the gages.

In the micrometer there is no excuse or use for so much strength. It is adjustable; the machinist may know, by its reading, when the work is correct; he may also run the screw back and measure, without crowding, the actual size at any stage. In the case of the micrometer the man uses his brains and his eyes more, and saves his strength for riding a bicycle, or other work where strength is useful. I have found it easy to teach men to use micrometers. I have had experience in running a shop (on a small scale) for nine years, and have used nothing in the way of gages, on close work, but micrometers. If it can be done on a small scale successfully, why not on a large one?

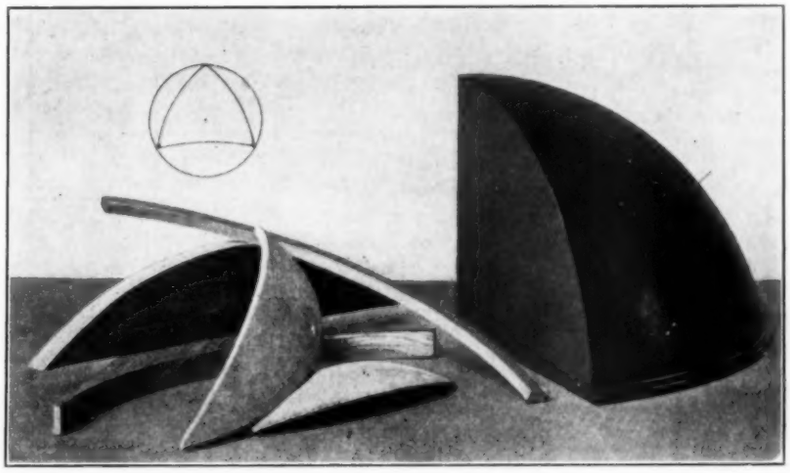
Mr. Perfection says no two men can measure alike with a micrometer. This is serious. There is a very funny thing comes in right here. Men who have worked perhaps twenty years at the business, and who perhaps have never worked closer than .002 inch in their lives, unless by accident, when they get to using micrometers, will sometimes get it into their heads that if they can't work to absolute perfection it is of no use; when nearly as close work as, with their best efforts, they have been in the habit of doing, can be done with the micrometer, with almost no effort. Where great accuracy is required, great care must be taken with the gages, whatever kind they may be.

Along with micrometers, in every shop, there should be a good set of solid test-pieces, either end measures or disks. Someone should be detailed to look out for the adjustments of all the micrometers in the shop. This someone should be skilled in such work. It should not be left to everybody. Where very close results are required, two sets of test measures should be kept, one for general use, the other for occasional reference only. Some of the micrometers should be kept for the finest work only, where those that are more worn or otherwise more inaccurate can be used on work of less refinement.

Graduated disks should be fitted to the feed screws of all machine tools. If the micrometers in use are graduated to read in thousandths of an inch, these dials should also read the same.

Fig. 1 shows a dial I use on a shaper. It is simply a cast-iron disk, 4½ inches diameter, graduated on its outer edge. The holes *e e e* and jaw slits are for the purpose of giving it proper spring tension. It is sprung on over the hub of a wheel or the end of a screw. There is a pointer attached to any convenient place. With this arrangement any reading can start at zero, by simply turning, at the start, the dial on hub *I*, so that the zero line corresponds with pointer. This makes a very cheap and good dial, and can be used on most machines. It can be graduated, of course, on either the face or the edge.

There is some work in every shop where the requirements do not call for actual measurements in inches. Sometimes a casting is made in two parts, for convenience in handling only, and they are to be fitted together for keeps. In some such cases, no doubt, it is cheaper and just as good to fit the parts together in the old way. When it comes to fitting, in this way, the micrometer is especially valuable. The concern in which I am interested is now getting out a line of micrometers measuring from 6 to 12 inches, of the pattern shown in Fig. 2. They are intended especially for the larger class of machine work. The frames are steel castings, 5-32 inch thick in the web. The measuring screw is the same as for the smaller sizes. JOHN T. SLOCOMB.



THE PATTERN AND ALL THE WASTE MATERIAL.

Saving Stock and Labor in Making a Spherical Pattern.

Editor American Machinist:

I send you photograph of a pattern for a corner feed-box with metal ¼ inch thick, the photograph showing not only the outside of the pattern, but also the waste lumber in making it. There was no other waste, except the shavings. The pin sticking in the turned portion is the key to the solution of the little waste in the turned part. Instead of turning a full half-hollow hemisphere and then using one-quarter of it, I only turned a little

more than a quarter of one, as the little sketch up at the left will show. The sketch shows the idea, but not the exact shape. The pin in the photograph is in the center of the turned part. This trick, as will be seen, saved both time and material. J. L. GARD.

An Unsuccessful Job.

Editor American Machinist:

I noticed some time ago in your columns an account of a difficult and successful repair job on a large table for pressing rubber, and now I want to tell about a similar job which was not successful. It was on a table for rolling heavy glass, and, as near as I can remember, it was about 5 feet wide, 14 feet long and 6 inches thick. The top surface of the table was grooved about 20 per inch, 1-64 inch deep, and it had a crack about 2 feet long, running across it in a serpentine path. My job was to chip a groove, ½ inch deep, ⅜ inch wide at the top, 13-32 at the bottom, and long enough to take out the crack. I also drilled ⅜-inch holes, ½ inch deep, at intervals of 1 inch, commencing ½ inch from the end. I then turned a tit, ⅜ inch diameter by ½ inch long, on the end of a piece of Swedish iron, ⅜x1 inch, and cut it off 1⅛ inches long, including the tit, which left a head on it, ⅜x1x⅝ inch, which was filed on the sides, so as to make it small at the top, and to the same angle as the slot. This made it 1-32 inch loose sideways from top to bottom; the tit was a tight drive fit. It took twenty-five or thirty of these pieces. These were put in the slot and pounded with a light sledge until they filled it and pushed up the cast iron slightly on the sides.

I next devised and made a hand plane, something similar to a carpenter's jack-plane, except that the cutter, which was a piece of ⅝-inch round steel, was adjusted by a cam movement. Then first with a square-nose tool I planed off the projecting Swedish iron down level with the table. I then put in the other tool, with teeth on it like the rib, and planed ribs across it. This made a first-class job of it, as far as workmanship was concerned, no joint being visible, and the rib was perfectly smooth and straight. The superintendent of the glass works and my employer examined the job together and concluded that it was all right.

The table was put into use again, and in about three days that superintendent telephoned to the shop that those pieces were coming up out of the table. I went down to the factory, taking my plane along with me, and I found that the pieces were high on the edges in a concave shape, and that the middle was little, if any, higher than the surface of the table. I planed it down even, and in three days more I had to plane it down again. I think I planed it down five or six times in all, and it was then concluded that the job was a failure. The only reason I could ever think of for those pieces acting that way was that the heat liberated the tension put in it by pounding them with the sledge, and that they were gradually assuming their original form. The table when in use got heated to probably 200 degrees Fahr.

I would like to hear from others of your readers who have had a similar experience. J. DUNN.

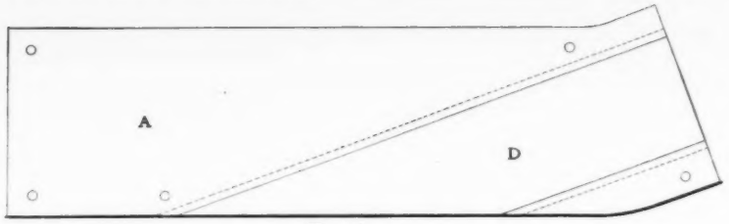


Fig. 1

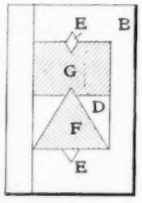


Fig. 2

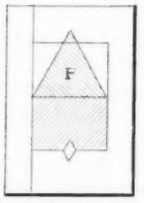


Fig. 3

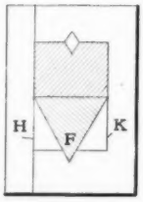


Fig. 4

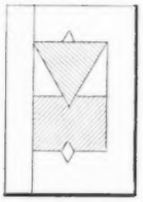


Fig. 5

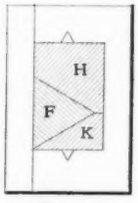


Fig. 6

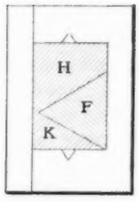


Fig. 7

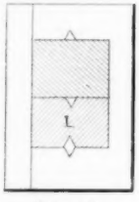


Fig. 8

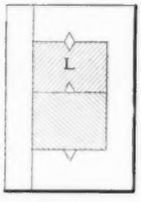


Fig. 9

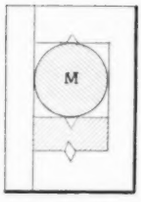


Fig. 10

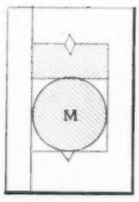


Fig. 11
American Machinist

COMBINATION LATHE TOOL HOLDER.

Combination Lathe-Tool Holder.

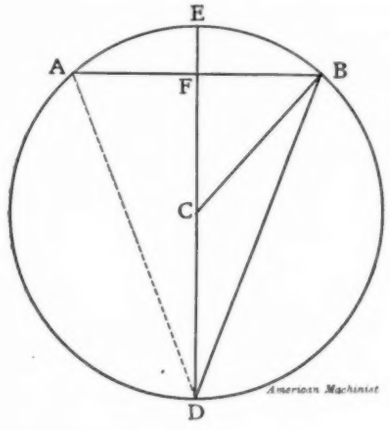
Editor American Machinist:

The sketches show a lathe tool, or a lathe-tool holder, of my designing, which is intended to use "bits" of any cross-section and to hold them in any desired position. It was primarily designed to hold triangular steel bits, as steel of this section is apt to be better than that of other shapes, but it is available for square, round, hexagonal, octagonal, or any other section. It consists of a steel holder or shank *A*, in which there is a channel *D* with slight taper, formed by pinning, brazing or screwing the cap *C* on to the body *B*. This channel *D* has two small triangular grooves *E E*, which serve to center and steady a triangular bit *F* when held in place by the wedge *G*. As may be seen from Figs. 2 to 5, this arrangement permits of holding the bit either flat side up or angle up, and at two different hights. By the use of two wedges *H* and *K*, Figs. 6 and 7, the bit may be held with the flat side either right or left. Figs. 8 to 11 show square tools *L* and round tools *M*, held in the same hole, with the rectangular wedge. G.

The Side Play of the Calipers.

Editor American Machinist:

A recent contributor to the columns of the "American Machinist" calls attention to one of the familiar old devices of the machinist: that of giving the inside calipers a certain amount of side play when for any purpose it is desirable to obtain a measure minutely less than the full diameter of the hole, as in making a loose or running fit, such as that of a journal in a solid bearing, or a sliding fit, as of a plunger in a cylinder, and the writer gives at the end of his letter a list of the allowances he has found it proper to make for different diameters. The trick is a practically serviceable one, and it has occurred to me that it would be a little better if we knew the actual differences of dimension which are obtained by different amounts of vibration of the calipers, and so I have taken the time to do a little figuring for the benefit of whom it may concern among the readers of the "American Machinist." The thing which struck me as the result of my arithmetic was the



minuteness of differences obtainable by this device. It is a micrometrical contrivance whose results are as fine and as reliable as those obtainable by costly instruments.

Having the circle $A\,B\,D$, with the diameter $E\,D$, we wish to know what will be the length of $A\,D$ or $B\,D$ for different lengths of $A\,B$. I have not found a very quick and easy way to do it, and it may be that there is a considerably shorter cut than mine, and, if so, I will be glad to know it. The job, of course, is too fine for the slide rule, which, after all, not to speak of it disrespectfully, works too rapidly to give us fine results.

Knowing the diameter of the hole $E\,D$, and assuming some definite length for $A\,B$, the total side play of the calipers, we have the length $F\,B$, one-half of $A\,B$, and $C\,B$ or $C\,D$, one-half of $E\,D$, to find the length of $B\,D$. In the right-angled triangle $F\,B\,C$ we have $FC = \sqrt{(CB)^2 - (FB)^2}$. Then, having the length $F\,C$, and the length $C\,D$ being known, we add them together for the length $F\,D$. Then, with $F\,B$ as before, we have $BD = \sqrt{(FB)^2 + (FD)^2}$.

We can take a case and arithmetic it out. Say that the diameter $E\,D$ is 10 inches and the side play is 1 inch, then $C\,B$ will be 5 inches and $F\,B$ will be 0.5 inch. The length $F\,C$, then, will be $\sqrt{5^2 - 0.5^2} = \sqrt{25 - .25} = \sqrt{24.75} = 4.9749 +$. Then for the length $F\,D$, or $F\,C + C\,D$, we have $4.9749 + 5 = 9.9749$, and then $BD = \sqrt{(FB)^2 + (FD)^2} = \sqrt{(.5)^2 + 9.9749^2} = \sqrt{.25 + 99.4986} = \sqrt{99.7486} = 9.9874$ inches. Here we have in a 10-inch hole with a side play of 1 inch a difference of size of only a little over one one-hundredth of an inch, which gives us a little idea of the fineness with which the device will theoretically work. In practice the results are, of course, not so fine, because usually we only guess at the actual amount of the side play, but the guessing of a trained machinist is not far from his actual measuring.

I give below a little list or table of the reduced dimensions for different amounts of side play of the calipers in a 12-inch hole. From this, of course, the dimensions may be obtained for holes of other diameters by simple division. Thus, where in the list the side play is 2 inches, if we divide the items by 4 we have the side play and the reduced dimension for a 3-inch hole, or .5 inch and 2.9894 inches respectively:

A List or Table of the Reduced Diameters indicated by Inside Calipers for Different Amounts of Side Play in a 12-inch Hole:

Side Play.	
.1	11.9999
.2	11.9991
.4	11.9983
.6	11.9962
.8	11.9933
1.0	11.9895
1.2	11.9849
1.4	11.9795
1.6	11.9730
1.8	11.9660
2.0	11.9579
2.2	11.9490
2.4	11.9391
2.5	11.9339
3.0	11.9044

MORRIS FULTON.

Different Ways of Looking at Things.

Editor American Machinist:

In the recently published volume of "Questions and Answers from the American Machinist" there are some curious things. Question No. 115 asks: "Which is the proper way to place a globe valve—with the steam pressure tending to hold the valve on its seat or tending to assist in opening the valve?" and the answer is that the valve should be so placed that the steam pressure will come under the valve. Now, question No. 136 asks practically the same question: "Is it correct to put a globe valve, in a steam pipe connecting the engine to the boiler, with the pressure on top of the valve?" The answer to this is just the reverse of the answer to the question previously quoted. It says: "The pressure should be on top of the valve." The question comes up at once as to which of these is right, and then whichever is right the other of course is wrong, and it should not have been printed; thus directly charging the compiler with carelessness or perhaps ignorance, or some other bad thing.

It happens that my statement of the case as given above is unfair, because it is incomplete. With each of the answers quoted there were advanced some reasons tending to justify it, and these reasons on either side were such as to entitle them to consideration, and looking at them together they show quite clearly that there are two tenable sides to the question, or that under different circumstances either answer might be correct, so that the presumption is that the compiler did right in reproducing both answers, so long as the reasons for each were also thus given.

In favor of having the pressure under the valve it is urged that: "When the steam was shut off the stuffing box would then be relieved of pressure, and, if necessary, it would be possible to repack the stuffing box, while with the steam above the valve it could not be done. It is also much easier to open the valve, and, if the opening required is small, it is easier to adjust it if the pressure is under the valve. With the pressure above the valve it is difficult to adjust the opening fine, as the slack of the valve on the spindle allows it to jump a little one way or the other, while with the pressure under the valve the slack or lost motion is always taken up by the steam pressure." All of that is self-evident, and of course we should have the pressure under the valve.

Well, how then about the considerations advanced for having the pressure on top of the valve? It is said in the answer to the second question: "The pressure should be on top of the valve, so as to relieve the thread on the spindle of pressure as much as possible. The advantage of this is that when the valve is closed there will be no danger of its flying open, as might be the case when the pressure is on the bottom of the valve and the thread on the spindle is stripped off. Particularly in a battery of boilers, we should always have the pressure on top of the valve, so that when one boiler is shut off for repairs and cleaning, while the other boilers are under pressure, the life of a man will not depend on the thread of the screw."

Personally, I have generally argued for having the pressure under the valve, but I must confess that I have sometimes had to do with such valves where considerable was depending on them, and where the

stems were old and badly worn, and then I have found myself wishing that things were different.

It does not look as if anybody would be misled by the appearance of the two apparently contradictory answers referred to. To such questions as these nobody wants arbitrary, point-blank answers without any reasons for them; and where the reasons are given, the answer is not likely to be very misleading. If the reasons advanced do not fit the special case, it is evident that the answer also is not likely to fit, and it will not be blindly accepted and followed. The relative force and value of the reasons advanced on either side can only be correctly appreciated when those for the other side are known also. The questions and answers in the columns of the "American Machinist," and those collected from it in the book, it seems to me, assume that the reader wants to know not merely what is the fact, but especially why it is so, and how it is related to other known and understandable things. It would be better for us if in both our formal and informal questioning, in our direct asking of individuals for categorical answers, and in our questioning of Nature by experiment, we always took pains to inform ourselves as much as possible concerning everything on the other side.

TECUMSEH SWIFT.

The Three-Leg Center Punch—The Knife-Edge Square.

Editor American Machinist:

The sketch shows a three-leg center-punch which I have been using for some time for laying off a continuous series of

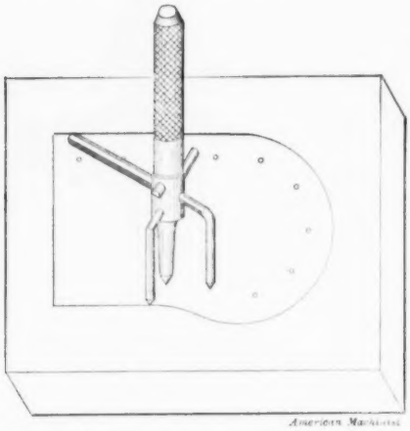


FIG. 1. THREE-LEGGED CENTER PUNCH IN USE.

equi-distant centers along a straight or a curved line. The tool is a very useful one to the diemaker or machinist in general. One of the legs is the center-punch proper, the other two are adjustable pins, and serve to get the proper distances from center to center and from the given line to the center.

By following with one leg along the given line and stepping off with the other the center distance, centers can be laid off very rapidly. The tool, as seen in the cut, Fig. 1, is a simple one, and is easily made. The adjustable rods are flattened on top and are held firmly in place after adjusting by a key, the holes in which they slide cutting each other. As there are no screws or nuts to jar loose while using this tool, and it being also one which any

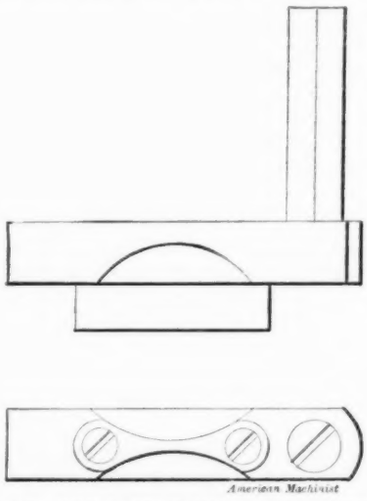


FIG. 2. KNIFE-EDGE SQUARE WITH HANDLE.

mechanic can readily make for himself, I consider it a handy thing to have around.

Referring to the article on "A Knife-Edge Square," on page 260, the contributor of the same must admit that a square of such fineness will naturally spring out of truth from the heat of the fingers while holding it. I have used the square shown in Fig. 2 with a wooden handle fastened to the head of it. The handle is also convenient for picking up the square. The space left for dust at the vertex of the angle by "A. B. C." I consider a drawback, as that part of the square is most valuable. The square here shown was made of tool steel hardened and drawn to a light straw.

H. JEHLE.

Baron De Hirsch Trade School, New York.

The Band Saw in the Pattern Shop.

Editor American Machinist:

In a certain pattern shop, employing a large number of men, there are two band-sawing machines using wide blades that are seldom sharp and with so little set that it is a difficult job to turn the work in a circle of 6 inches diameter, while it is not an unusual occurrence for quite a bunch of men to collect around the operators, waiting for their turn at the machines, such as they are. The same story can be told of many other shops. Now, this is all wrong, to my mind, and I would like to speak of some of the little points that have taught me to respect "the milling machine of the pattern shop."

The machine itself, if only one is needed, should be of the tilting, *iron* table type, and if two or more are used, one should be left-handed—that is, the table tilting the opposite way, as this machine will then saw angles that are simply impossible to cut on its right-handed mate; and if there are not less than fifteen men employed, I would recommend the purchase of a third machine with a table that does not tilt, but with wheels that do; for I find that this machine has advantages that neither of the other two possesses—chief of which is that your stock will not have a tendency to slip away from the saw blade, as in the tilting-table style, when sawing at any angle over 30 degrees or so, and it may not be amiss to state here that the machines should all take the same length of saw blade; for interchangeability is a good thing even in a pattern shop, whose platform should be: *"For every five men employed a band-saw we'll have."*

The blades should never be any wider than ½ inch, and I would say that the ¼-inch width, six points to the inch, is the most effective for all-around requirements, and, if properly taken care of, it will last about two months, even with frequent filing and setting. That, by the way, ought to occur often enough to keep a half-dozen sharp saws always ready to put on at a moment's notice.

It will pay to use filing and setting machines, even if the one that does the filing does only cut "straight across" and not "both ways," as a saw blade should be; for it's a long job to file a saw by hand, and this life of ours is so provokingly short.

Several of your correspondents who write, elucidatively and otherwise, on subjects pertaining to pattern work have described their methods of making gear wheels; and, while I have not read every issue of the "American Machinist," I have yet to see any article on pattern-making that advocates the use of the band-saw for shaping the teeth of gears. That it can be done admits of no question, as I have seen spur wheels made, from a few inches pitch diameter to over 5 feet, with various widths of face, "laid out" only on one side, the band-saw doing the rest, and doing it right, too, with draft on each side of the teeth, just enough to swear by, and in a great many cases no sandpaper was used before varnishing, the cuts were so smooth.

Let me digress from the subject at hand to criticise the "teeth former" used by Mr. Richardson to sandpaper, and by others to plane, the teeth of gears; it is most beautiful in theory but not in practice, for where, oh! where, is the wood-butcher that can work so close as to not destroy the accuracy of the "former" and teeth by constant use or misuse? And, moreover, the method used is all wrong anyhow, as working the teeth out separately and gluing the same on to the rim to alleged center lines, is an excellent way to make an inaccurately spaced gear

wheel, with the teeth pointing seven ways for Sunday.

On bevel and miter gears the band-saw will do good work if you provide for it, as it is not to be expected that a large wheel with the teeth solidly glued on could be so handled as to produce good results; but with teeth that have been dovetailed on, a jig can be made for the large end to rest on, and from the "lay-out" on the inside to saw to, a sharp saw to saw with, and a sawyer who can saw, you will have a perfectly formed tooth every time. The conditions, of course, are ideal, as the saw, when the table is tilted to the desired angle, always points to a common center and cuts accordingly.

It will also cut spiral gears within limits, say 3 degrees; and for cutting worm threads and worm-wheel teeth it is without question a valuable help to the workmen who know how.

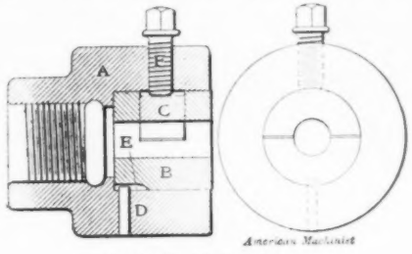
The sawing of taper coreboxes, in fact so-called tapered work of any kind, is too ancient to discuss, as most of the "cult" are entirely familiar with this class of work; but it is interesting to see "the noblest Roman of them all" use the band-saw to cut within $\frac{1}{8}$ inch of the line, with the avowed intention of chewing the rest off with plane or chisel, when with a little care, and considerably less time, the saw would have saved him the trouble.

OLD BOB.

A Home Made Chuck.

Editor American Machinist:

The other day there was a chuck required for some lathe work, that would hold round pieces while the ends were operated on in various ways. It must run



A HOME MADE CHUCK.

true and hold firm, be easy of operation and not liable to get out of order—in fact, something a boy could use.

The accompanying sketch shows what was devised, and it needs little explanation. The body of the chuck A is made of cast iron, fitted to the spindle of the lathe. The front end is bored to some suitable standard size (in this case $2\frac{1}{2}$ inches) to fit the bushings, which are made in two parts, B and C. The bushings are made so that they will fit nicely in the chuck, but not tight enough to bind, as they are to be put in by hand. The pin D and milled groove E hold the bushings in the proper pace. The work is held by being clamped by the part C, which gives a firm hold without marring the work. For accurate work, the hole in the bushing should be left a little small and trued out to size when all is in position. Upon cutting about 1-32 inch from the flat faces of C after the boring, and rounding the sharp edges off a little, the chuck is ready for use. Any number of bushings can be made, and also any number of the holders as may be desired, and with a little care all will interchange, making a useful tool for many purposes.

The bushings may be made of cast iron for ordinary work, but for very severe service or for work that requires accuracy tool steel will be better.

CHAS. BENSON.

A Flywheel Joint Milling Machine.

Editor American Machinist:

We send you enclosed some views of a machine tool built by Mr. Richards, according to our instructions, for milling the edges of our flywheels. It gives us entire satisfaction and does perfect work.

As you may see, the machine may be moved on a base A, and it is fastened before one joint of the flywheel; then the milling cutter works, going downwards. The machine is driven by a Jaspar dynamo.

The cross-bar B forms a bearing for the piece E on which, together with F and a similar piece at the other joint, we lay the flywheel.

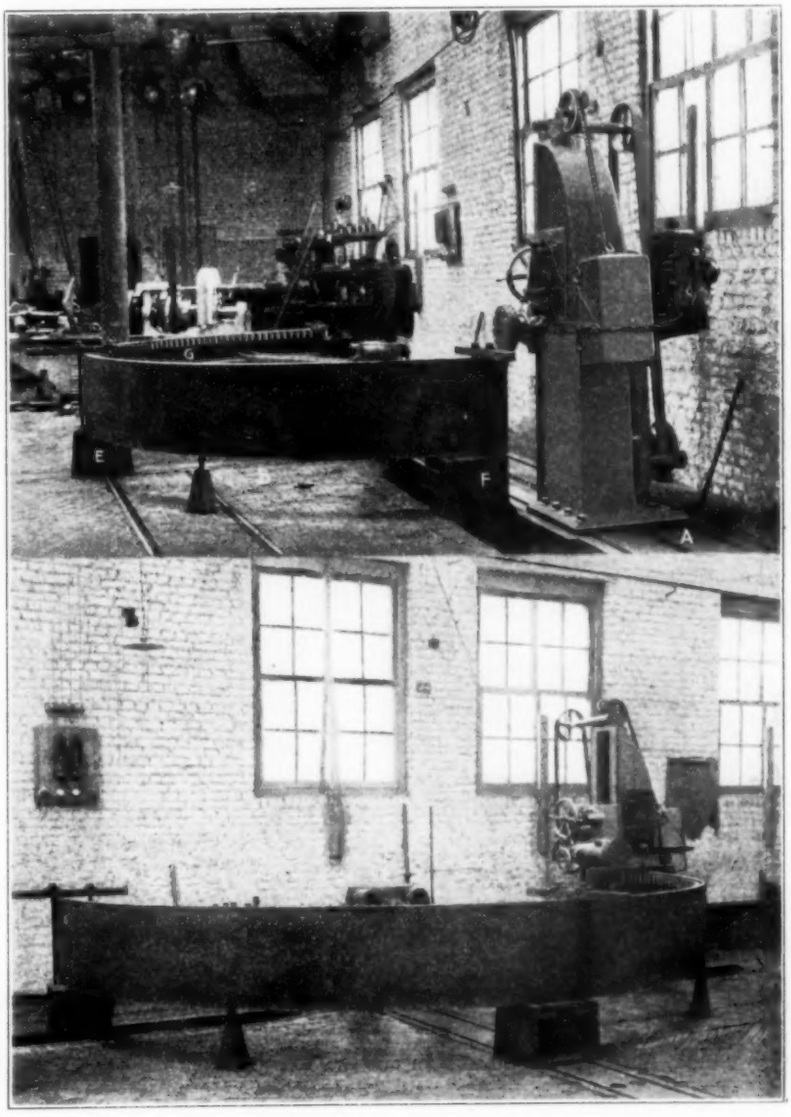
As a settling of B may happen, we mill one half of the flywheel with rack G upwards, and the other half with the rack downwards. The flywheel thus comes out perfectly straight, without taking any care when laying it on the three feet.

In the background of one of the pictures you will see our five Gisholt lathes.

H. BOLLINCKX.

Brussels, Belgium.

[Mr. Bollinckx' practice of milling these joints with one side up for one half of the wheel and the other side up for the other half is a very neat thing. A little study will show that, supposing the outer support E to be too low or too high, the



TWO VIEWS OF A FLYWHEEL JOINT MILLING MACHINE.

only effect will be to make the joint run across the face of the wheel at a corresponding angle instead of square across, but the wheel itself will be straight; whereas if both halves were milled the same side up, the wheel would be crooked sidewise, unless the three supports were in a plane exactly at right angles to the milled cut.—Ed.]

Finishing Collars on a Jones & Lamson Turret Lathe.

Editor American Machinist:

The writer at one time was with a concern who used a great many shafting collars in sizes from 1 to 2 15-16 inch bore,

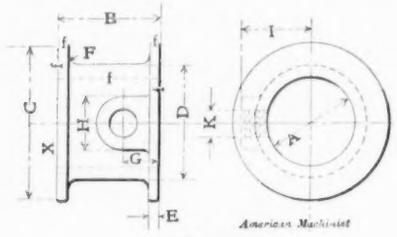


FIG. 1.

A	B	C	D	E	F	G	H	I	K
1	1¼	1¾	1¼	1/8	3/16	½	¾	13/16	5/16
1 3/16	1½	2⅛	1 5/16	5/32	3/16	9/16	¾	15/16	5/16
1 7/16	1¾	2¼	1⅞	3/16	7/32	5/8	⅞	1¼	⅜
1 11/16	2	2⅞	2 3/16	3/32	¼	¾	1	1¾	½
1 15/16	2 3/16	3¼	2 7/16	3/32	¼	¾	1⅛	1½	½
2 3/16	2 7/16	3¾	2¾	¼	9/32	⅞	1¼	1 11/16	5/8
2 7/16	2⅝	4⅛	3⅛	¼	5/16	1	1⅜	1⅞	5/8
2 11/16	2⅞	4½	3 1/16	1/16	⅜	1	1⅜	2	5/8
2 15/16	3⅛	4⅞	3 11/16	5/16	⅜	1⅛	1⅝	2¼	¾

SKETCH AND TABLE OF COLLARS TO BE MADE.

shown in Fig. 1 and the accompanying table. As they had to be furnished at a low price, it was decided to finish them in a Jones & Lamson turret lathe which was not constantly in use.

The attachments for this purpose are shown in the accompanying sketches. Fig. 2 represents an angle casting or arm threaded to fit the lathe spindle and provided with a counterbalance to prevent vibrations at high speeds. This arm was planed and slotted as shown. The clamp, Fig. 3, was made in two pieces and was planed on the bottom to fit the slots in the arm. Each collar required a separate clamp, which was bored in position to fit the outside of the collar. The clamp was held together by a T-headed bolt which, when the nut was loosened, could be given a quarter turn and removed. It was prevented from turning, when tightened, by the device shown in the small detail sketch. The jaws of the clamp were planed to fit the set-screw boss on the collar, thus preventing the latter from turning, and locating it when drilling the hole for the set-screw. The clamp was secured to the arm by a cap-screw. The facing and turning tools, shown in Fig. 4, were held in the cutting-off attachment. The front tool was used for roughing, and was also ground on the side to give a smooth scraping cut for finishing the face. The rear tool was used for rounding over the flange. Double-ended cutters were used for boring.

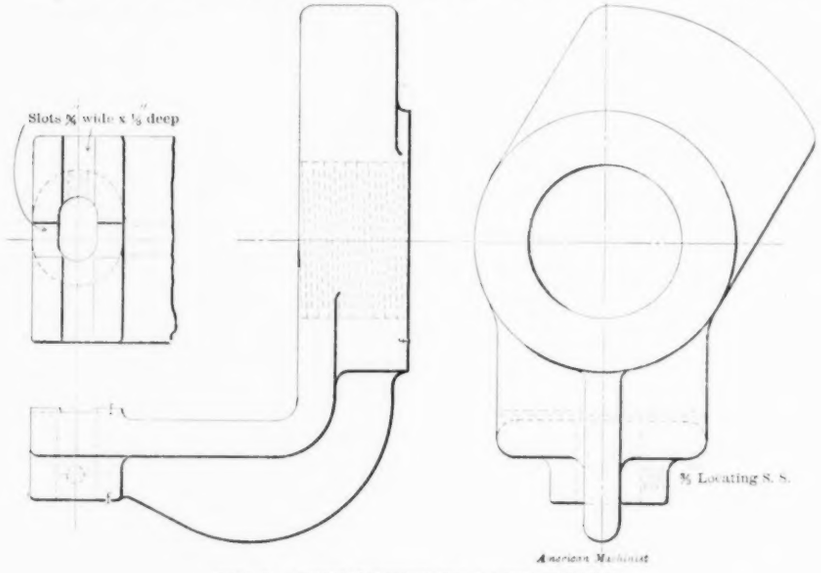


FIG. 2. ANGLE CASTING FOR LATHE SPINDLE.

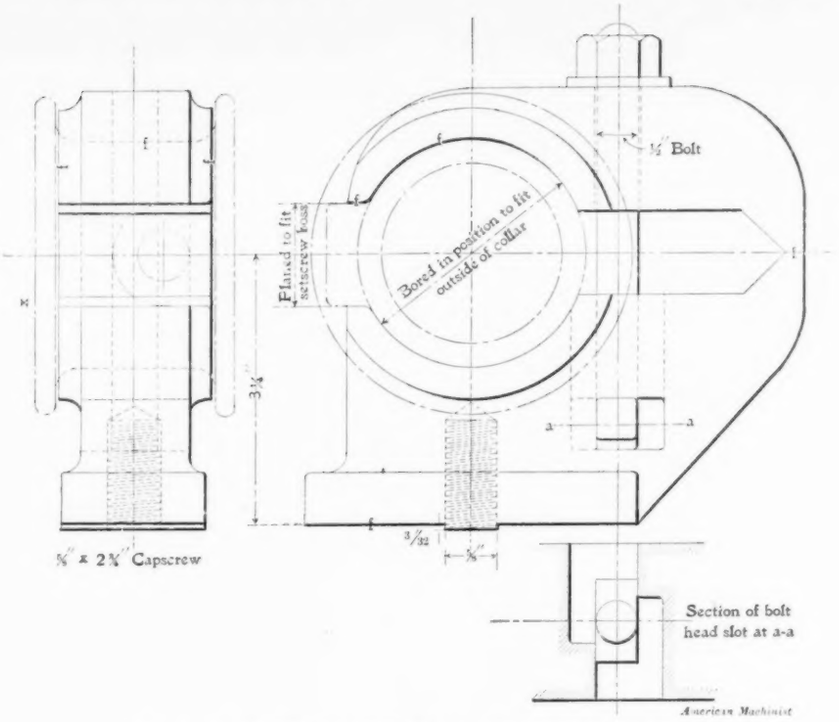


FIG. 3. CLAMP FOR HOLDING COLLAR, WITH COLLAR IN PLACE.

In operation the collar was clamped so that the face *x*, which ran against the journal box, was faced at the same time that the hole was bored. The cap-screw was then loosened, the clamp turned halfway around and again secured. The other flange was then finished and rounded over. To drill and tap the set-screw hole, the clamp was turned quarter way, which brought the boss in line with the drill.

This hole was not in the center of the collar, and the clamp was moved sideways until the cap-screw brought up against the small locating set-screw in the arm and then secured in position. This locating set-screw was adjusted for each size of collar.

In practice the rig worked well, finishing the collars cheaply as well as satisfactorily. S.

Notes to Put on the Drill and Tap Gage.

Editor American Machinist:

On page 266 Mr. A. C. French says there is a lot of space to let on the other side of his drill and tap gage. I would suggest that on the drill side he stamp the proper number of revolutions for the different size drills, as there are quite a few users of drills who are almost wholly

unacquainted with the proper speed at which to run them.

On the tap side Mr. French might stamp his own name and that of the manufacturer; and if he had any space left, he might stamp the proper size tap wrench to use, opposite the different sizes of taps; or, if he prefers, he can stamp the breaking strength of the different taps, and

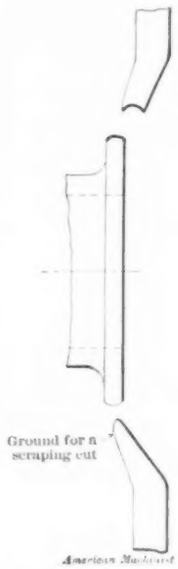


FIG. 4. FLANGE FINISHING TOOLS.

when he gets one stamped that will fit (not the majority) the common average of taps he can send me one, as I am sadly in need of such a list.

I am not sure that the everlasting breaking of taps and drills is such a good thing for the makers, as too much of it has a tendency to make me distrust the quality of their goods. G. SCHNEIDER.

Uses of the Combination Square.

Editor American Machinist:

No doubt we all have seen at times our own ideas and inventions improved upon, or used to better advantage than we have used them. So the sketches herewith might convey some new ideas in conjunction with that awfully accurate combination square. I do think it might be of advantage to the makers to offer an extra base for a slight advance in cost. No. 1 shows the square used as a hight gage which will go into places that a surface gage cannot. No. 2 shows an outside caliper. No. 3 shows how odd shapes may be calipered on the outside. Mr. Edwin Etler, a clever planer hand at the R. K. Le Blond shops, Cincinnati, should get a patent on these ideas.

Cincinnati. H. L. CAMERON.

A Traveling Journeyman.

Editor American Machinist:

We have all of us met the traveling journeyman, the fellow that comes in and doesn't have any tools, picks up the first pair of overalls and jumper he can find, says that his are coming in a day or two, and borrows your soap and towel; but that is not the kind I mean.

For the past few weeks I have had a shopmate, a tramping journeyman, who is a very different kind of a man; so much so that I think you would like to hear about him. He is a good fellow, somewhere about thirty years old, and a "German-American," I should think. He started from San Francisco in 1897, stopped off at Salt Lake City, Denver, Omaha, and finally struck Chicago. Here he stopped a few months and then started again, working his way through Indiana, Ohio, Pennsylvania, and finally landed in New York in time to get a job as an oiler on a tramp steamer to Liverpool.

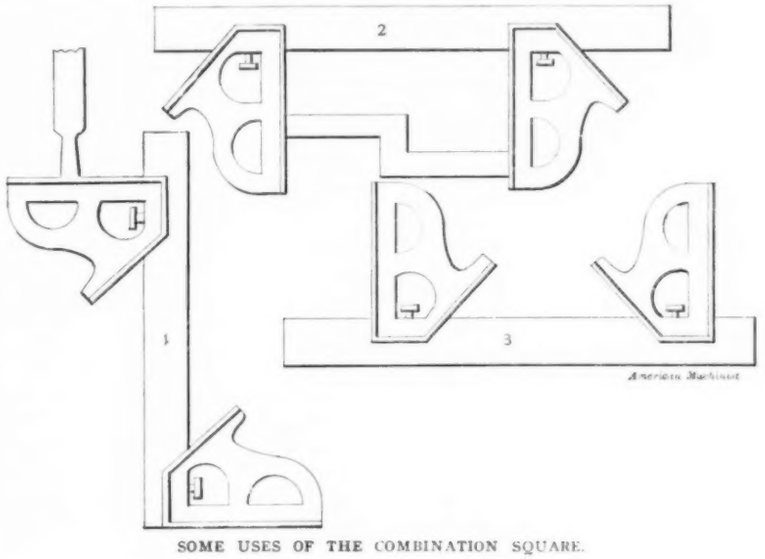
The chief engineer of the steamer was an Englishman, a regular Johny Bull, and, much against the grain, our friend had to be English, too—that is, he had to admit that any steamer that was fit to be called a steamer was made in England—and once he even had to allow, to save himself from being chucked overboard, that the United States steamer "Oregon," which he himself had helped build, was made in England.

Well, he reached Liverpool, then London, and then across the Channel to the Paris Exposition. Here he staid some time, taking in the fair and also the customs of the country, and trying to put up a little French, with but indifferent success; for going into a café one night and calling out in his best French for what he supposed was a sandwich and coffee, the waiter brought him in five schooners of beer, and in spite of all he could do he had to pay the bill, although he was not compelled to drink the beer.

While in Paris he sent home a French loaf of bread to his friends in California, to show them that he had enough and to spare. Leaving Paris and the Fair, our tramp turned his attention to England, Scotland, Ireland, and finally found his way back to Liverpool, and then to America in the same capacity as that in which he went over. He landed in New York, worked there a few months in a marine shop, then came through Connecticut to Ansonia, Bridgeport, and finally to Providence, where I saw him. Work gave out in the shop where we were, and our tramp started again for the coast of Maine, from whence he was intending to go through Vermont, New Hampshire, and on to Buffalo in time to take in the Pan-American Exhibition, then to St. Louis to the Fair there, and then to California by way of Chicago.

In his wanderings our tramp had gone in shape, lived in respectable company, and was a gentleman, as well as a good workman. He had a collection of over 700 photographs, taken by himself, as well as an assortment of souvenirs that many a tourist would be glad to possess.

I am sorry to say I do not feel at liberty to give you his name, for I know that some of your readers may come across him in his travels. This is not written in praise or defense of the man, but simply shows what a man who has a trade and no home ties may do in the way of seeing the world. A. P. PRESS

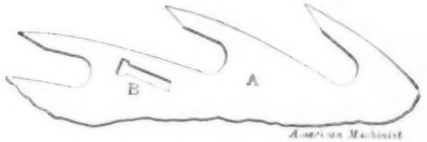


SOME USES OF THE COMBINATION SQUARE.

Circular Rip Saw Teeth.

Editor American Machinist:

On page 326 "M. E. W." has written about small circular saws; he files his cut-off saws correctly for good, fast work, but he can make a vast improvement in



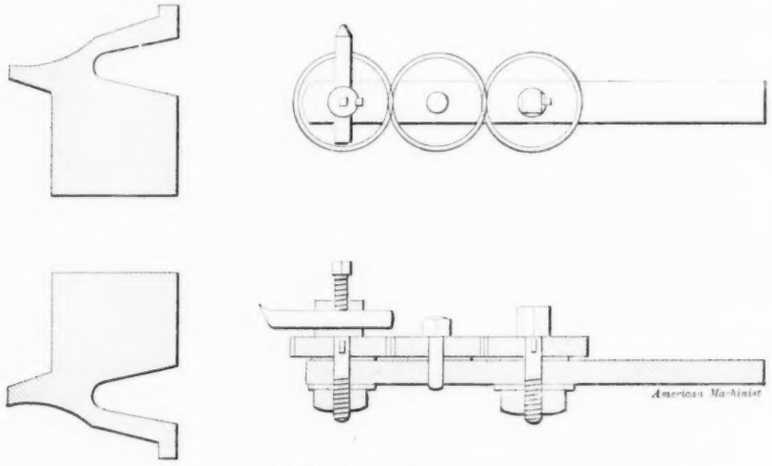
his rip saws by filing and gumming as per sketch herewith. I use a Standard saw gummer with a 3/8-inch cutter to throat the teeth, and a No. 3 "Conqueror" saw swage to swage the teeth. After swaging and side-filing the tooth appears as at *B*,

the profile of the finished tooth as at *A*. It is absolutely necessary the saw should be round. I have found that a rip saw dressed in this manner will cut faster and do better work with less power than if filed in the manner described in the letter referred to. I would like to have the writer give this a trial. H. S. PORTER.

A Rig for Circular Boring.

Editor American Machinist:

A boring job came to the shop which made us rack our brain for a few days for a satisfactory way to do it. The job



RIG FOR CIRCULAR BORING.

is shown in the sketch. It was to bore the circular bottom of the annular V-channel. The sides were easily done with the compound rest. It struck me that if we could swing a tool in the arc of the circle, as shown, we might make a good job of it; so that was what we did. We took three of the smallest change gears from a 13-inch lathe and mounted them on the top of a good stiff bar, putting the smallest at the end and the other two in mesh with it. We set a feather in the stud or bolt, and cut a keyway in the gear so that the bolt or stud would turn with the gear. We drilled a hole through the upper end of the stud just above the gear to insert the cutter, holding same by a set-screw. We ran the stud down through the bar and put a nut and washer on the under side, so that we could hold the gear down with friction enough to keep the gear up to the cut without chattering or pushing away from the work. The center gear we just put a cap screw through and into the bar. The third gear we mounted on a stud with a feather the same as the first one, only using a square head on the stud, where we put the wrench to turn the train of gears and thereby make the cutter describe the circle. The reason we used three gears was to get out far enough from the work to use the wrench. We roughed out with ordinary tools and used the above device for finishing and got a very satisfactory job. FRED A. TYGARD.

Pittsburgh, Pa.

A Worm-Cutting Curiosity.

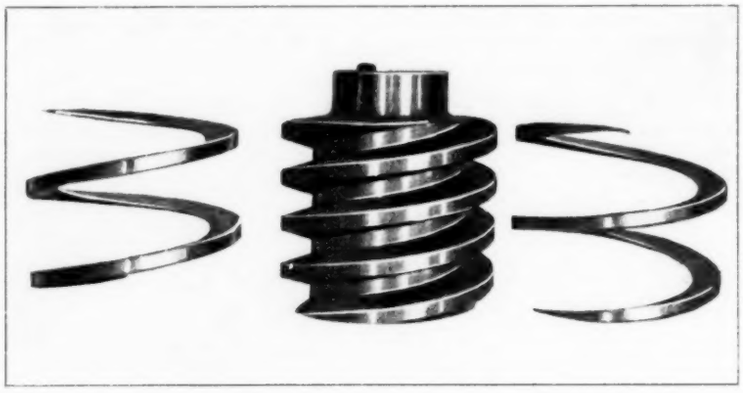
Editor American Machinist:

I was recently looking over some photographs of various "stunts" which which I have had to deal, and I came across one that I thought might prove to be of interest to some of your readers who have similar work on hand. At about the time the photograph was made, our shop had a large number of worms to make. These were from 4½ to 8 inches diameter and from 1 to 4 inches lead, the latter being double threaded. We cut these on a lathe of about 16-inch swing, having a compound rest. The stock from which they were made was .50 carbon open-hearth steel, and terribly tough.

After a few had been cut, I found that it took so long to rough out these worms that I set to work to see if a reduction might not be made in the time required to remove the stock between the threads. I made a tool similar to the ordinary cutting-off tool, except that the shank was twisted to correspond to the angle of the thread at the pitch line. Enough clearance was given to each side to properly clear at all parts of the thread, this necessary clearance being found by trial. The width of the cutting edge was made equal to one-half the width of the flat at the bottom of the thread. The worms were cut by feeding this tool in by means of the compound rest, set at 14½ degrees either side of its central position.

The result of the operation is very clearly set forth by the photograph, which shows a double threaded worm, about 7½ inches outside diameter and 1½-inch pitch (3-inch lead). The two coils at either side of the finished worm show how the stock was removed in roughing out, the spirals being merely unscrewed after they were cut loose.

No doubt many of your readers have cut worms in this manner "many years ago," possibly "before the war," but it was a novelty in our shop, and it may be in others. FRED B. COREY.

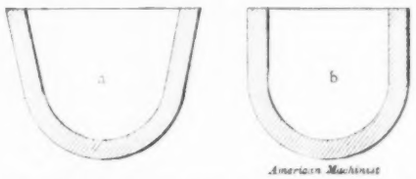


A WORM-CUTTING CURIOSITY.

The Possibilities of the Planing Tool.

Editor American Machinist:

We have had occasion a number of times, in manufacturing, to do work with special shaving or planing tools. This has proven a much more accurate and a cheaper method than the usual way of milling. We ask ourselves, has the milling cutter so much advantage over the planing tool in removing stock and machining a true surface? We all know that a cutter, to work free, must have sufficient rake to allow the chips to be removed without too much breaking up, and there must be enough metal backing up the cutting edge to withstand the strain of the cut. This is the case with all cutting tools, whether a drill, a milling cutter or a planer tool. The planer tool has a big advantage, in that it can have ample rake for free cutting, and at the same time have plenty of backing to support the cutting edge.



SECTION OF HAND VISE BEFORE AND AFTER CLOSING.

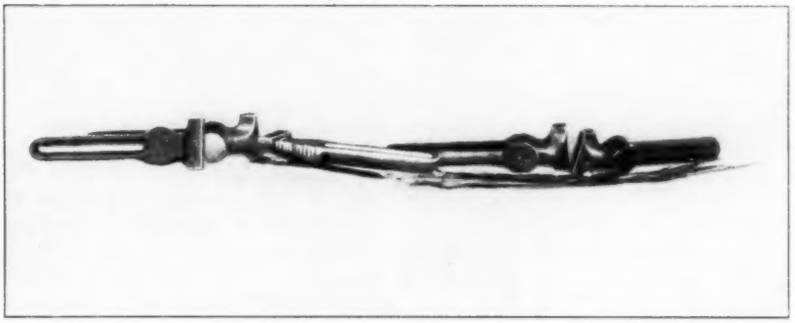


FIG. 1. HAND VISE FORGINGS "BEFORE" AND "AFTER," WITH SHAVINGS.

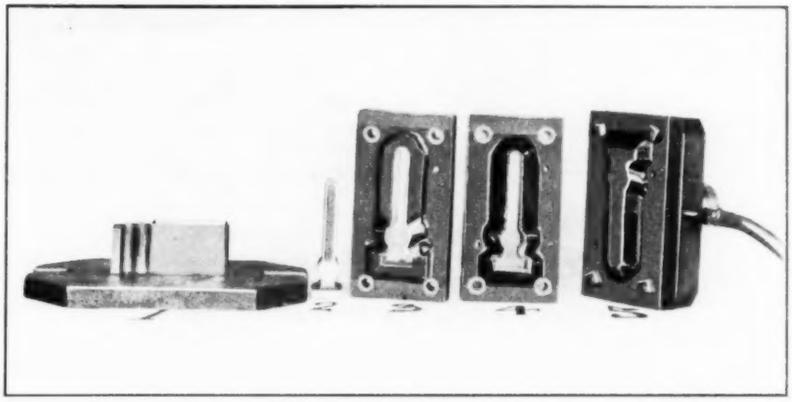


FIG. 2. PUNCHES AND DIES FOR TRIMMING HAND VISE FORGINGS.

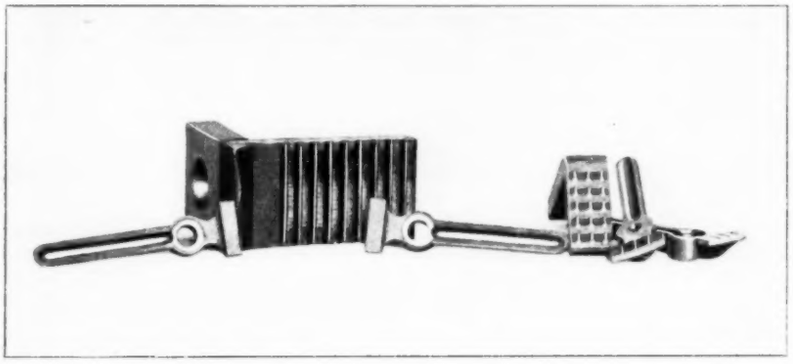


FIG. 3. TOOLS FOR "CHECKERING" AND GROOVING VISE JAWS.

Now, why not give the planing tool more cutting edges? Give it a wider cut, and make it in series, to first break up the surface with serrated tools and then follow with tools to remove the stock and make the finishing cut. The question that presents itself is: what is the limit of size of cut that can be taken? Given a machine of sufficient strength and proper tools, may not a surface be machined in one stroke that in the old way takes hundreds?

To illustrate: With a profiling fixture, the hand vise-jaw shown kept a man comfortably busy to turn out 150 in ten hours. With the set of dies illustrated, a boy easily finished, in three operations, 400 in 9½ hours. With a stroke of sufficient length, and by building the die in series, this could as well be increased to 1,200 pieces in the same time. The length of the cut around the vise jaw is about nine inches, and it was made at about 15 feet per minute. If a 9-inch cut is possible and practical, why not 18-inch or 36-inch?

Another example is the checkering and the V-grooves on the face of the jaw. These operations were both done on a 14-inch Hendey shaper. The checkering was done at the rate of 1,000 per day, and we do not think the most exacting would find fault with 300 in the same time on a miller. The grooving went easily at 1,500 per day. The work will, we think, compare favorably with the average milling work. We find that with proper rake on the tools there is less tendency to spring the work than in milling. In some instances we have found it possible to use as much as 20 to 30 degrees of rake.

Another point in favor of this form of tool is that it does not need relieving on the return stroke, as the work can be removed before that occurs. Should the cutter return over the work, only the last cutting edge will touch. This is not a serious fault where the tool is strong and heavy and the material soft. This practice allows the cutter to be fastened solidly to the ram of the machine, making it less liable to spring or chatter.

In the photograph, Fig. 1, are shown some of the forgings in different stages. At the left are the rough forgings, showing the slot or gutter in the handle before it was closed. It was necessary to forge the slot with considerable draft to the sides, as at *a*, Fig. 4, which is an enlarged section across the middle of the straight part in order to get the required depth. They were put through a drawing or closing die to bring the sides parallel, as at *b*, before putting them through the shaving dies. At the center of the picture is a forging after it has been through the roughing die, showing the serrations, where the cut was heaviest. At the right are shown some of the forgings after the finishing operation. The dies, shown in Fig. 2, were made the reverse from the usual way. The punch was fitted to a die-block on the bolster plate, and the dies to a holder in the ram. This arrangement made it easy to place and hold the forgings in position, by centering the slot on the projection on the punch. The work was flooded by pumping oil through a tube connected to the die-holder, shown at the right of the photograph. The dies were 1½ inches thick, made straight on the inside and with a 30-degree rake on the cutting edge. The cut taken by the roughing dies varied from .005 to .040 inch, being heaviest around the boss where the die was serrated. The second die was enough smaller than the first to clean up the serrations. The third, or finishing die, had a uniform cut of about .002 inch.

The tool for doing the checkering on the face of the jaw is 2½ inches wide and was made to fasten direct to the clapper block. The cutting part of the tool projected back of the center of the clapper block, under the ram. The cutting edges of the tool were made by a series of steps of about .005 inch, and were given a rake of about 15 degrees. This was found sufficient to give a free cutting edge. The object in putting the cutting edges back of the center of the clapper block was to prevent the cutter from "hogging." With the cutter in this position the tendency is to spring away from the work under a heavy cut. The cutter for making the grooves was similar to the one doing the checkering. Fig. 3 shows the cutters and the work.

W. A. WARMAN and R. B. COCHRANE.

Repairing a Broken Eccentric.

Editor American Machinist:

On page 157 an account was given of the means employed to repair a broken eccentric. I had an experience of a simi-

lar accident some years ago, and I thought I would tell you how I got over the trouble. It was a case of a break-down in the engine furnishing the motive power for a printing press, and the break occurred at the last minute, when everything was ready to run off the evening edition of the paper. I found the eccentric broken exactly like the one illustrated in your paper, which was repaired by shrinking on a wrought-iron band, etc. As this break had to be repaired quickly, I used some stiff putty and built a dam on each side of the eccentric and backed the putty with boards. While I was getting this ready I had a ladle in the furnace of the boiler filled with old type metal. I was careful to pour at a low heat into the receptacle prepared for the metal, cleaned off the putty, cooled the eccentric, put on the eccentric strap, etc., and started up. Time, about thirty minutes; cost, 15 cents for putty. I forgot to say that the eccentric was tightened together by a rope twisted by a short stick put in the bight. This eccentric ran for months, but was replaced by a new one. J. T. L.

Turning Tapers.

Editor American Machinist:

Any desired taper may be turned by attaching a bar from headstock to tailstock as per sketch, or, if construction permits, clamping it to the lathe bed, preferably the latter, as it permits the turning of a short taper at the end of a long shaft. Attach a short bar to tool block with roller on end to engage the directing bar. Remove the crank from the cross-feed screw, put on pulley, and attach cord and weight sufficient to turn the screw and ensure contact with the directing bar.

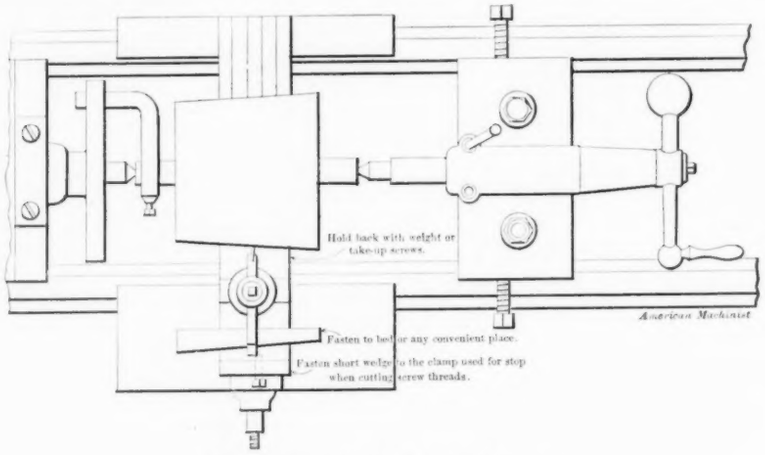
A TAPER TURNING ATTACHMENT.

The cord may be carried to a sheave overhead if necessary, to give sufficient travel to the weight. If the lathe has no compound rest, the adjustment of the tool for depth of cut must be done by rapping it, or the short connecting bar may be made to do it. Irregular forms may be turned by attaching suitable templets or formers to the bar. A. B. C.

An Improvised Taper Attachment.

Editor American Machinist:

In answer to "Young Fellow's" inquiry, on page 392, as to how to turn tapers without a taper attachment, I submit this sketch, which I think will explain itself,


Hold back with weight or take-up screws.
Fasten to bed or any convenient place.
Fasten short wedge to the clamp used for stop when cutting screw threads.
American Machinist

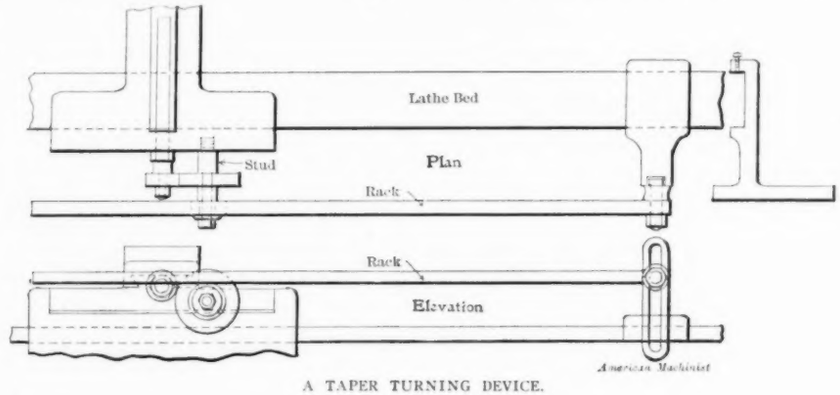
AN IMPROVISED TAPER ATTACHMENT.

and it can be gotten up very cheaply. I designed this rig for cutting some screw threads on the inside of a chuck used on a Weymouth lathe. The angle was very steep, being about 60 degrees, and the hole at the bottom about ½ inch. F. A. N.

A Rig for Turning Tapers.

Editor American Machinist:

In reply to the article signed "Young Fellow" on page 392, I send a sketch of an attachment which can be used to good advantage for turning tapers. The handle on the cross-feed screw of the carriage is to be removed and a suitable gear put in its place—for example, one of twenty teeth—and a stud is screwed into the front of the cariage so that, say, a sixty-tooth gear will mesh into the twenty, this gear having a long hub to hold another which can be of any required number of teeth and changeable for different tapers. This gear we will run in a rack which bears upon it and is fastened to a support secured to the bed of the lathe at any suitable point. Now, suppose the cross-feed screw to be 8 threads to the inch and we wish to turn a taper one inch and a half to the foot. We will put on a gear for the rack to run on, which will give the screw one turn for every inch the carriage moves. The gears used can be any size to suit the lathe, so that the regular screw-cutting change gears can be used for different tapers. Not a Very Old Chap.



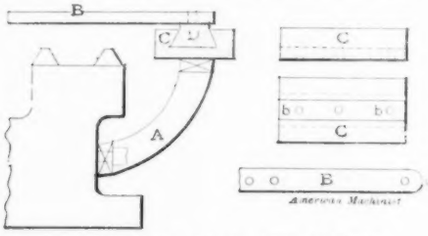
A TAPER TURNING DEVICE.

This device was used by the Baldwin Locomotive Works in making several thousand bumper castings for the Rus-

A Quickly Made Taper Attachment.

Editor American Machinist:

The sketch herewith is in reply to "Young Fellow's" inquiry for a plan for turning taper or conical pulleys. Make a bracket A and fasten to the back of the lathe about opposite the place where the taper turning is to be done. On top of *A* fasten slide *C*, in which block *D* slides freely. Take out the screw in the cross-slide, fasten bar *B* to block *D* and to the tool-carrying part of the rest. The block *C* will swivel on dowel pin *a*, and can be fastened to bracket *A* by bolts *b b* when the correct taper is found. The tool can be set in or out by the compound rest, and the cut should be started from the larger diameter toward the smaller.



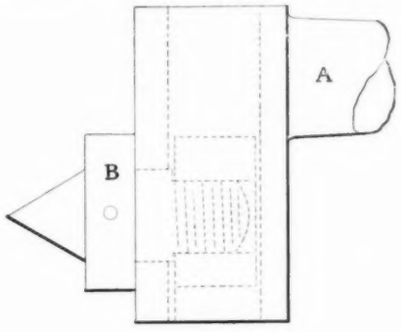
QUICKLY MADE TAPER ATTACHMENT.

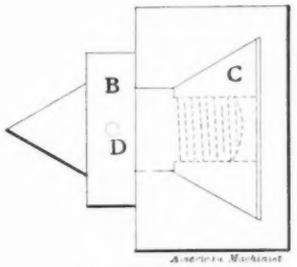
sian engines. There were a number of lathes with taper attachments, but not enough to get out this order in the time required. JOSHUA F. WEEKS.

An Offset Lathe Center.

Editor American Machinist:

I notice that on page 392 a "Young Fellow" asks for a way a common lathe can be arranged for turning tapers. I submit a sketch of a center I used some years ago on a lathe which, besides having no taper attachment, had not even a set-over tailstock. *A* is the body, of forged steel,





AN OFFSET LATHE CENTER.

turned to fit the taper hole in the tail spindle, dovetailed slot being planed lengthwise of the face. A nut *C* is made a good fit in the slot *A*, and a tool-steel piece *B* is turned for a center, the end threaded and screwed into nut *C*. Holes *D* are drilled around the large part of the center, so that it may be screwed up tight. Any taper can be turned, within the range of the slot, by simply shifting the center to the required place.

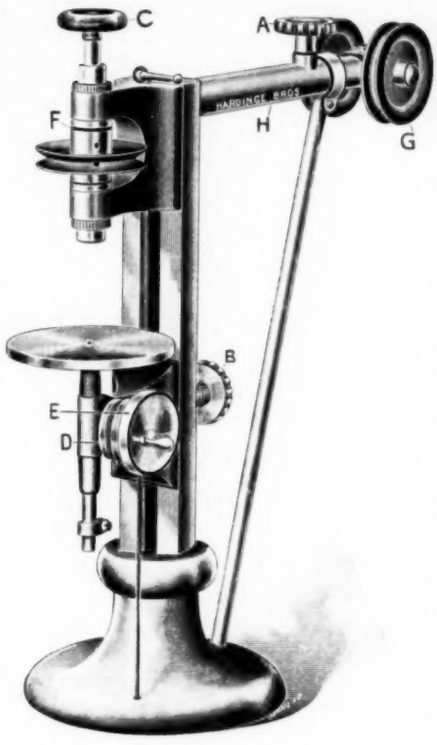
M. H. WESTBROOK.

Some New Things.

A FINE DRILL PRESS.

Hardinge Bros., of 1036 Lincoln avenue, Chicago, Ill., have brought out an improved drill press which is designed especially for very light and at the same time very accurate drilling.

Hardinge Bros. are manufacturers of watchmakers' tools, and this driller has a post, the face of which is an exact duplicate of their watch-toolmaker's bench lathe, the head and bracket supporting the table being, in fact, interchangeable with their lathe head- and foot-stocks. The spindle is in this case supplied with the



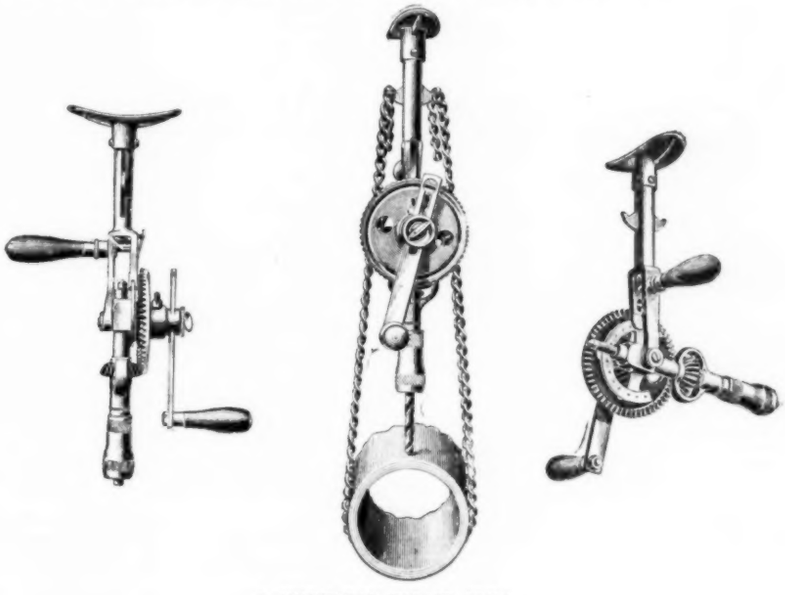
A FINE DRILL PRESS.

usual draw chucks for holding drills, which may range in size from 0.010 to 0.250 of an inch. These are tightened by the draw spindle wheel *C* in the usual way. There is a ball thrust bearing for the spindle and the spindle has bearings that are hardened and ground, the drive being by a round belt from the countershaft, changes of speed being provided for by a cone pulley upon the latter. The bracket supporting the table is adjustable upon the column and the table has a rack and pinion feed with spring counterbalance a cord being passed over the spring disk to a foot treadle or knee lever below the bench by which the feeding may be done when desired.

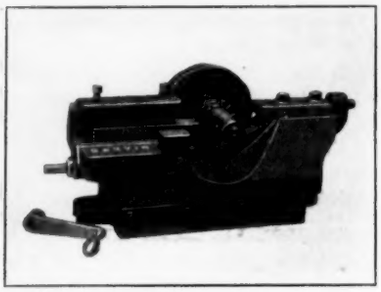
When these drillers are used in numbers together the round base is removed and a long base, upon which all the columns stand, is substituted for it. Other features of the machine will be readily understood from the engraving.

A UNIVERSAL BREAST DRILL.

The cuts show a breast drill "with all the modern improvements." It has a number of devices which greatly increase the range of its adaptability. Lack of space will permit us only to simply enumerate the various features without attempting to explain them. As a breast drill proper the spindle has two speeds, of about 1⅓ and 3 to one revolution of the crank. A ball bearing takes the thrust of the spindle. The length of the crank is changeable anywhere from 3½ to 6 inches. The crank will drive the spindle constantly or by a ratchet movement in either direction, so that it may be used in places where there is not room to turn the crank, and it may be used for driving and backing out a tap. Projecting horns are seen on the stem under the breast plate. These are used, in connection with a chain as shown, for clamping the drill to the work and applying pressure to the drill without the use of the breast plate. Turning the side handle rotates a screw in the stem, which advances the chain horns and thus the drill is fed. The drilling spindle may be swung off at different angles to the body of the drill, and when so used there is a center pointed screw at the back end of the spindle, operated by a pin wrench, which may be used, as with a common ratchet drill, for the feed. When in any angular position the two speeds of rotation, the ratchet movement in either direction and the changeable length of crank are, of course, still available. This drill is made by the Sound Beach Tool Company, Sound Beach, Conn.

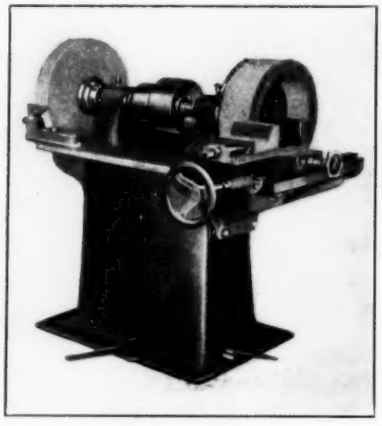


A UNIVERSAL BREAST DRILL.



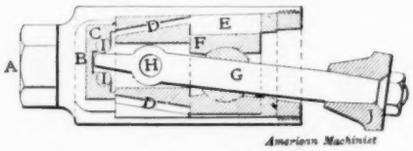
BACKING-OFF DEVICE.

We give herewith an illustration of a device for backing-off milling or gear cutters and which device is made as an attachment that may be clamped to the table of a milling machine or to a lathe carriage, as may be most convenient. The device consists essentially of a base plate to which is fitted a sliding piece having attached to its upper surface two plates which are adjustable to and from the center and carry rollers that contact with a cam placed upon the same arbor on which the cutter to be backed off is placed. The form tool used in backing off is clamped in place by the set screws shown and by the rotation of the cam is advanced and receded at the proper times as required, while at the same time it has an independent adjustment toward or from the cutter. The cam, though it is keyed to the arbor as one piece, is really made of two pieces, one of which is fastened to the other by screws, so that the one may be rotated upon the other if occasion requires. The adjustment of the pieces carrying the contact rolls enables all lost motion to be eliminated and the slide is moved positively in both directions. The device is made by The Garvin Machine Company, Spring and Varick streets, New York.



A GRINDER WITH SLIDE REST.

A grinding machine has been brought out by the Bridgeport Safety Emery Wheel Company, of Bridgeport, Conn., which, in addition to the ordinary functions of such a machine has at one end a vise mounted upon a rest which has the u ual movements at right angles to each other, and by means of which dies may be sharpened and a good deal of other work done which is not practicable upon a machine not so equipped. The engraving will, we believe, explain itself.



THE DEAN BOILER TUBE CLEANER.

We show herewith an ingenious boiler-tube cleaner, operated by steam or compressed air. It depends on the rapid vibration, pendulum fashion, of a rod carrying a plain hammer *J*, which knocks the scale from the outside of the fire tube, through which it is thrust, or a cutting hammer for chipping the scale from the inside of water-tubes. The vibrator is marked *G* in the cut. Steam enters through a hose attached at *A* and passes alternately through the ports *D* into the opposite ends of the cylinder *E*, causing the piston *F* to reciprocate. The rod *G* is pivoted at *H*, and its rear end striking the steel shoulders *I I* in the valve *C* controls the admission of steam. The port on the side opposite to the position of the valve is closed by the piston an instant before the valve shifts.

The normal steam pressure required is 40 or 50 pounds, which will give the hammer a speed of 800 to 1,000 strokes a minute. Its effectiveness depends rather upon the rapidity of the blows than upon their force, which is not sufficient to injure the tubes. The hammer used for chipping the scale in water tubes is so guarded that the edge cannot reach the tube itself. When used for this purpose the cleaner is to be given a rotary as well as longitudinal movement through the tube which may be accomplished with a device arranged as follows: The machine is attached to a pipe fully as long as the tube, a collar with a removable lip is fitted to the boiler front, a long screw with a hand-wheel slides over the pipe and is fastened to it; the cleaner is thus fed with a twisting motion into the tube by the wheel, while jets of live steam eject the loosened *debris*.

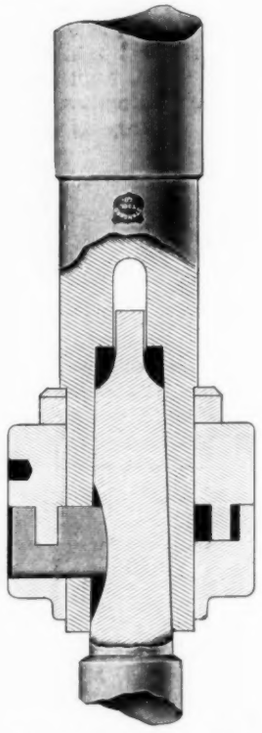
For cleaning a fire-tube three to five minutes are required; for a water-tube, five minutes to half an hour.

The Dean cleaner is made in various sizes by the Power Specialty Company, 487 Ellicott square, Buffalo, N. Y.

AUTOMATIC CONTROLLER FOR INDUCED DRAFT APPARATUS.

The Buffalo Forge Company has brought out an automatic controller for induced draft apparatus in which the fan is driven by an electric motor.

The fan motor is fitted with a special controller which is actuated by the boiler pressure—a decrease in the pressure being at once followed by an increase in the speed of the fan, and *vice versa*. The draft is thus regulated to suit the demand on the boiler for steam, and a nearly constant pressure of steam is maintained. The electric motor is, of course, an extremely suitable driving agent for fans, and its growing use in connection with induced draft fans has called for a controller of this kind.

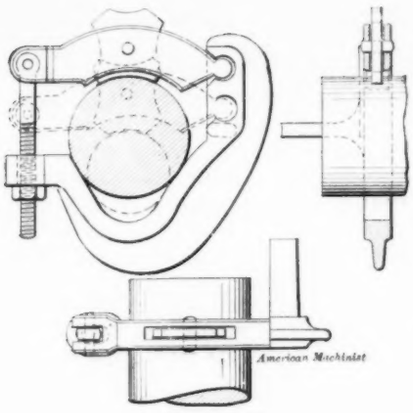


A POSITIVE DRIVE DRILL SOCKET.

The cut shows a drill socket which cannot fail to hold drills, boring tools or taps absolutely without slipping. The taper shanks to be driven have a longitudinal groove milled in the side, and when inserted in the socket a sliding tongue is slipped into this groove and holds the shank from turning. The upper edge of the sliding tongue has a notch cut in it, outside the drill socket, and into this notch sits a spiral or scroll tongue on the under face of the large collar. Turning this collar of course moves the tongue in or out. The collar is usually turned by hand, but if the shank turns and binds the tongue, a pin wrench in the collar may be used. This socket is made in all the various sizes for either taper or straight shanks by the Standard Tool Company, Cleveland, Ohio.

A LATHE DOG.

The cut shows a lathe dog recently patented, which requires little explanation. It has the advantage that it does not insist upon being slipped over the end of the piece to be driven. When the nut is slacked, the round end of the binding crossbar may be slipped around sideways, and the bar may be swung back out of the way. The two notches provided give the dog a considerable range as to



A LATHE DOG.

size. A tail on the side is provided to engage in a slot of the face-plate for driving. Steel or malleable iron castings being used, the dog may be cheaply made. The swiveled piece in the crossbar, with different shapes on the different sides of it, will be noticed. On the smaller sizes a wing or thumb-nut might be used.

The disks shown are covered with emery cloth or paper, secured by a quick-drying cement. The disks have no grooves and run at a speed of 2,200 revolutions per minute, so that they cut much faster, cleaner and truer than solid wheels and last a considerable time. When one side of the disk is used up it is reversed. The worn sheets are easily stripped off and may be quickly renewed.

The table is accurately placed at right angles to the face of the wheel, and is moved back and forth with the work on it by means of the quadrant gear and rack underneath. The protractor guide on the near table is accurately graduated in degrees, so that adjustments may be made for any required angle on the work. A plain table in front of the other wheel is used for the ordinary forms of right-angled surface grinding. Special jigs and attachments may of course be made for any pieces to be ground in sufficient quantity to warrant it. This grinding machine is made by the Dodge Manufacturing Company, Mishawaka, Ind.

A DISK GRINDING MACHINE.

The machine shown in the half-tone is used for grinding off rough surfaces on drop forgings and castings of all kinds where those surfaces are flat and are required to be finished, such as dies, nuts, wrenches, bolt heads, links, rod keys and straps, electrical work of all kinds, etc. The machine does not use emery wheels.

Engineer-in-Chief Melville has been making a tour of inspection of the Northern navy yards with especial reference to their machinery equipment. He found that at Portsmouth, N. H., an entirely new plant would be necessary. He wants a machine shop, boiler shop, copper shop, smith shop, pattern shop, foundry and administration building. These will cost not less than $300,000, and as only $50,000 is available Congress will be called upon for further appropriation.

Under recent decisions of the German customs authorities it appears that certain agricultural implements which have the handles painted are liable to an increased duty because of the embellishment. The duty on an office safe was doubled because of small decalcomania pictures on the door. Upholstery greatly increases the rates payable on vehicles.

A board of naval officers at Washington are to conduct a series of tests of the Hohenstein water tube boiler, built by the Oil City Boiler Works, of Oil City, Pa., with, as is understood, the Standard Oil Company behind them. A 1,000 horse-power boiler has been built and a special steel structure erected for the tests, so that the conditions will be similar to those on the Denver class of unprotected cruisers. The boiler is of the standard navy length and dimensions and the tubes are straight, the water only passing through pairs of the tubes, instead of a succession as in the Belleville boiler. Rear Admiral Melville, Engineer in Chief, is encouraging the experiments.

Questions and Answers.

Name and address of writer must accompany every question. Questions must pertain to our specialties and be of general interest. We cannot undertake to answer by mail.

(9) F. S. C., Wm. Penn P. O., says: Please inform me how to prevent the mercury from sticking to the inside surface of the glass of a mercury column used as a vacuum gage. I have tried cleaning it with kerosene, also benzine, but unless I keep water in the top part of the glass the mercury sticks or collects on the inside surface of the glass. A.—The mercury will not adhere to the glass if it is pure, except after the lapse of considerable time, say a year. In air thermometers a coating will collect after a long period of use, due probably to oxidization. To overcome this, use a drop of sulphuric acid on top of the column. If, however, you use pure mercury—that obtained by special distillation—and if the glass tube is clean, you should have no trouble.

(10) C. E. H. asks: (1) Is the axis of a pipe thread cut square with the axis of pipe, or square with the axis of taper? A.—Square with axis of pipe. (2) Will you furnish rule or give reference for determining the proportions of cast-iron heads for high-pressure heaters without stay-bolts? A.—If the head is flat there is no satisfactory rule for the purpose. Precedent and practice form the only guide. If the head is dished to a globular shape, it is usual to treat the case from the standpoint of a complete globe of the same radius, which should be of one-half the

thickness of a cylindrical shell of the same radius, the material and pressure being the same. But in dealing with cast iron this again is modified by the limitations of the casting process. The casting must not be very thin, even if the computation denotes that it might be.

(11) J. B. C., Toronto, says: For a certain purpose in which the bending moment is of importance, we are using hydraulic pipe 2⅜ O. D., 1¾ I. D. The proposition has been made to use for the same purpose 2½-inch standard pipe which is 2⅞ O. D. and 2.46 I. D. Which is the stronger? A.—The modulus of the section for a hollow round beam is given by the expression:

$$\frac{\pi}{32} \times \frac{D^4 - d^4}{D}$$

in which D = outside diameter
d = inside diameter.

Substituting the diameters of your pipes we find that for the hydraulic pipe the modulus = .93 and for the standard pipe the modulus = 1.08. The standard pipe is therefore the stronger in the ratio of $\frac{1.08}{.93} = 1.16$.

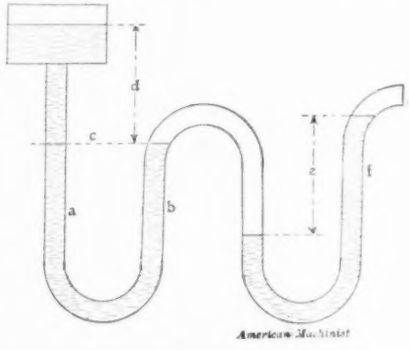
(12) E. F. S. asks: If two smokestacks of the same inside diameter and hight, one of brick, the other of steel unlined, are set up side by side over a chamber having an equal area or slightly more than both, into which the flue pipe leads from the boilers, will the draft in each stack be nearly the same? And will the combined draft of both be equal to one stack of the combined area of both? A.—We think there would be no material difference in the draft of the two stacks, though the greater loss of heat through the steel one would tend to make it draw slightly less than its mate. Two stacks are not quite equal to one of the same total area, because of greater frictional resistance and greater radiation. With large stacks the difference would be small, but with small ones it would probably be appreciable.

(13) G. R. M., Cleveland, Ohio, asks how the mean effective pressure of steam at various points of cut-off can be calculated by the slide rule. A.—Most slide rules now made have a scale at the center of the rear side of the slide for finding logarithms. The logarithms found by this scale are the common or Briggs logarithms, but by multiplying the value of such logarithm by the constant ratio 2.303, the hyperbolic logarithm is obtained which is required in finding the theoretical mean effective pressure. The procedure then is thus: Find the common logarithm of the ratio of expansion and multiply it by 2.303. Add 1 to the result and multiply by the terminal pressure. The result is of course the mean forward pressure, from which the back pressure must be subtracted to obtain the mean effective pressure. The multiplications may be performed upon either the upper or lower scales, according to the user's preference; but it scarcely seems feasible to construct a slide-rule formula to fit the case. One having much of this work to do will find it well worth while to obtain a Cox steam engine computer, which is a special slide rule for this purpose.

(14) J. H. W., Corry, Pa., asks: Where should the counterbalance be placed for an engine whose center line lies at an angle of 45 degrees with the horizontal? A.—The only proper location for a counterbalance for any engine is opposite the crank, but it is not always advisable to have a counterbalance. The effect of a counterbalance is to change the direction of the disturbing force—not to destroy it. If the counterbalance be equal in weight to the reciprocating parts and have its center of gravity at a distance from the center of the shaft equal to the throw of the crank, the disturbing force in line with the piston rod will be neutralized, but an equal disturbing effect will be introduced at right angles to the piston rod. If the engine be horizontal and stands on a firm foundation the result is beneficial; but if it stands on a springy ship's deck it may be harmful. If the engine be vertical and stands on a firm foundation, the result is harmful, but if it stands on a ship's deck beneficial. With your engine the effect of such a complete counterbalance would be neither beneficial nor harmful, as it would simply change the disturbing force from one 45-degree line to another at right angles to it without changing its magnitude. In such a case it would be better to partially counterbalance, making the counterweight of such size as to balance one-half the reciprocating parts. The result would then be an equal disturbing force on each 45-degree line, the magnitude of this force being just one-half of what it would be with either no counterbalance or with a complete counterbalance.

(15) "Springfield" says: To settle a dispute, please give your decision on the following: A contends that when the flywheel of a double-cylinder gas engine is placed directly in the center of the shaft, being equal distance from the two cranks, the two cranks being set on the same angle, that the "counterbalance" in the flywheel which is intended to balance the reciprocating parts acts with better effect on the two cranks than if the wheel were placed out of center, or near one of the cranks. B contends that the effect of the "counterbalance" in the flywheel is not vitiated by placing flywheel near one end of the shaft, or, in other words, that no matter what position the wheel occupies on the shaft the effect of the "counterbalance" is the same on the cranks. The desirability of having the weight of flywheel divided equally between the two shaft bearings is not to be considered in connection with this question. A.—By "the two cranks being set on the same angle" we understand you to mean that they pass the same center together. With this understanding, and the reciprocating parts of the two engines being supposed to be of the same weight, the wheel should be in the center of the shaft. Suppose the flywheel to be in the plane of one of the cylinders and you will see that its counterweight could have no effect on the other engine, and any approach to this position will have a corresponding effect in less degree. If the cranks pass the opposite centers together, no possible counterbalance in a single flywheel, no matter where placed, can balance the reciprocating parts.

(16) A. H. S., Clinton, Conn., asks: Will you kindly explain the theory of "air-bound pipes," mentioned on page 579 of "Kent." I have found but one explanation and that seems full of questionable points. The case in point is this: This village is supplied with water from a reservoir four miles away with a hydrostatic head of 168 feet. About a mile below the reservoir is a rise or summit in the pipe, and perhaps a half-mile below this is another and higher summit, neither one reaching the level of the reservoir.



Air filled these summits owing to anchor ice having temporarily checked the flow through the gratings at the main gatehouse. No air valves were provided at the high points. After clearing the gratings no water was obtained until the first and lower summit had been drilled, although the second one had been previously drilled. Size of pipe, 14 inches. I believe a plausible explanation will interest many others as well as the writer. A.—Air in a line of water pipe plays many queer tricks. The sketch shows a condition which may explain the action in this case. Comparing leg *a* with *b*, it is clear that the water in the two legs balances up to the dotted line *c*, leaving the head *d* to produce the flow. This head will produce an equivalent pressure in the air which will balance a head *e* in leg *f* equal to the head *d*. If this head *f* does not reach the outlet, no flow can take place. The air being under pressure, it will escape if an air cock in the head is opened and the flow will then begin.

The article on page 364, illustrating and describing "A Gang Die," was by Mr. Joseph V. Woodworth.

Personal.

William A. Canty, who has been foreman in the planer and shaper department of the Pratt & Whitney Company, of Hartford, Conn., has become foreman with the Reliance Machine and Tool Company, of Cleveland, Ohio, builders of the Morgan patent bolt cutters.

E. E. Cary, manager of the Packard Electric Company, Limited, has resigned owing to ill-health and has been succeeded by R. B. Hamilton, who during Mr. Cary's illness has been acting manager. Geo. A. Powell has returned after four months' absence and will manage the sales department.

Obituary.

John C. Porter, Jr., president of the Porter Foundry and Machine Company, Allegheny, Pa., died April 10, sixty-four years old. Mr. Porter learned the machinist's trade in Allegheny, was severely wounded in the Civil War, managed the machine department of a cotton mill, and in 1867 became junior member of the firm of which he was for the last ten years the head.

A correspondent wishes to know where he can procure metallic paper that will be attracted by a horseshoe magnet.

New Catalogs.

We have received a copy of special edition No. 12 of the catalog of the Chicago Pneumatic Tool Company, 635 Monadnock Block, Chicago. It is chiefly pictorial, showing various tools of the company by themselves and in operation. Size, standard, 9x6 inches.

The Babcock Printing Press Manufacturing Company, New London, Conn., has sent us a catalog of its printing presses, the "Optimus," intended for book, catalog and color printing, etc. Some half-tones in brilliant color are shown in the pamphlet, which is of standard size, 6x9 inches.

The Webster Manufacturing Company, Chicago, has published a 271-page catalog of elevating and conveying appliances. It generally resembles their former ones, and among the new features are those in the line of belt conveyors and marine leg apparatus for unloading vessels. Size, 4¾x6¾ inches.

We have received a copy of the 1900 catalog of the Billings & Spencer Company, Hartford, Conn., showing its improved drop hammers, improved trimming presses and forges. In it we note some illustrated lists of parts, dimension tables and tables for concrete foundations. The pamphlet is 7¾x10¼ inches.

The Standard Railway Equipment Company, St. Louis, Mo., has sent us a pneumatic tool catalog, plentifully illustrated and devoted to its "Monarch" hammers, riveters, drills, pneumatic holder-on, wood-boring machines, etc. There are detailed cuts and lists of parts of the chief of these tools. Size of catalog, standard, 9x6 inches.

The Gisholt Machine Company, Madison, Wis., has published a catalog, "K," of their tool-grinding machines. It contains a chart for grinding lathe and planer tools according to the Gisholt system, with numerous illustrations of different shapes of tools and directions for operating the tool-grinding machine. Size of catalog, 9¼x6 inches.

The "Yankee" Tool Book, No. 3, shows some hand tools manufactured by North Bros. Manufacturing Company, Philadelphia, Pa. They include ratchet screwdrivers, spiral-ratchet screwdrivers, chuck for same with wood drill points, automatic wood drills, reciprocating drill, pocket magazine screwdriver, etc. The pamphlet is 6x3½ inches, a standard size.

Blake & Johnson, Waterbury, Conn., have sent us a catalog of small rolling mills, slitting machines, presses of various sorts, emery grinders, and rivet, wire nail, bicycle rim rolling, thread rolling, wire forming, pin milling, key turning, spring coiling, furniture nail and eyelet machines, vertical milling machines, etc., etc. They also manufacture rivets, pins, screws, threaded wires, etc. The catalog is 6¾x9 inches.

"A Machine Shop Ideal: Every Tool Built by a Specialist," is the title of a somewhat novel trade publication emanating from Cincinnati, O. It holds up to notice jointly the tools of several different companies, to wit: Lathes of the Lodge & Shipley Machine Tool Company, shapers of the Cincinnati Shaper Company, radial drills of the Bickford Drill & Tool Company, upright drills of the Cincinnati Machine Tool Company, planers of the Cincinnati Planer Company, and milling machines of the Cincinnati Milling Machine Company. The pamphlet is 6x9 inches, standard.

Miscellaneous Wants.

Advertisements will be inserted under this head at 25 cents a line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Gear Wheels, gear cutting. Grant; see p. 38.

Caliper cat. free. E. G. Smith, Columbia, Pa.

Forming lathes. Mer.Mach.T.Co.,Meriden,Ct.

Punches & dies. Wal.M.Wks.,Waltham,Mass.

Wanted—Gray iron castings to make. Pattin Bros. & Co., Marietta, O.

Light and fine mach'y to order; models and elec. work specialty. E. O. Chase, Newark, N. J.

Book "Dies and Diemaking," $1, post paid, J.L.Lucas,Bridgeport,Ct. Send for index sheet.

Parallel drawing-board attachments; by mail, $1.50; circulars. F. G. Hobart,Beloit,Wis.

Selden Packing for Stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., New York.

For positions in charge, or competent men for such positions, address James Brady, 220 Broadway, New York City.

Special machinery, models, punches and dies; experimental work; accurate work. C. L. Pierce, Machinist, Gardner, Mass.

Wanted—To contract with some well-equipped machine shop for the manufacture of a light specialty. Box 23, AMER. MACH.

Advertiser wants a new set of catalogs of machinery. Address James Lang, Mech, Eng., 57 Canada Life Building, Toronto, Canada.

F. J. Stokes Machine Co., 13th and Noble sts., Philadelphia, cut light gears, cams, and duplicate small machine parts, in quantities.

Wanted—To correspond with parties having light machines, articles of hardware or tools to manufacture. Box 87, AMER. MACH.

Threads and gears; easy rules to cut any thread possible to be cut in the lathe, without algebra, sent to any address for 25c. by G. W. Dixon, Spring Lake, Mich.

Machinery to build; drawings, patterns, castings, forgings to order; inventions perfected; private rooms for experimenting. "Manufacturer," Box 886, New Haven, Conn.

Institutions retiring from business having machine tools, brass and wood working machinery will find it to their interest to correspond with us. We purchase complete plants or handle them on com. C. C. Wormer Mach. Co., 55-59 Woodbridge st., W., Detroit, Mich.

Fine Business Chance—Machine shop and foundry, full of work, in one of the best and most progressive cities in the Southwest; price $25,000; one-fourth cash, balance one to ten years; will answer favorable letters. Address "Texas," care AMERICAN MACHINIST.

Machine Work.—We have a new plant thoroughly equipped with high-grade machinery for doing all sorts of light machine work; estimates on drafting, toolmaking, experimental work and manufacture of specialties, etc., cheerfully furnished. The Bantam Mfg. Co., Bantam, Conn.

Wanted—To correspond with parties wishing to take up the manufacture of successful automatic steam engine, protected by valuable patents and already well and favorably known on the market; complete drawings and patterns for engines from 20 to 500 horse-power on hand; immediate trade assured. Address "Engineer," care AMERICAN MACHINIST.

Wants.

Situation and Help Advertisements only inserted under this head. Rate 25 cents a line for each insertion. About six words make a line. No advertisements under two lines accepted, and no advertisements abbreviated. The cash and copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded. Applicants may specify names to which their replies are not to be forwarded; but replies will not be returned. If not forwarded they will be destroyed without notice. Original letters of recommendation or other papers of value should not be inclosed to unknown correspondents.

Situations Wanted.

Mechanical draftsman desires position. Box 90, AMERICAN MACHINIST.

Draftsman; 10 years' experience; special machinery. Address J. M., care AM. MACH.

Position wanted by experienced draftsman having inventive ability. Box 45, AM. MACH.

Good, all-around machinist wants situation. O. Warncke, 527 Washington st., Hoboken,N.J.

Mechanical draftsman wishes position; can furnish first-class references. Box 78, A. M.

Position wanted by first-class machine blacksmith; wishes steady work. Box 438, Derby, Conn.

Blacksmith, a first-class tool-dresser, desires change within New England. Box [illegible], AMERICAN MACHINIST.

Mechanical draftsman and designer wishes position; New England or Eastern New York preferred. Address Box 47, AMER. MACH.

Jones & Lamson flat turret lathe; machinist-operator open for engagement; mention wages paid. Box 91, AMERICAN MACHINIST.

Experienced draftsman, graduate, desires change of position; blast furnace and steel mill machinery preferred. Box 79, AM. MACH.

Having left my former position, I should like to hear from parties wishing a competent iron foundry superintendent or foreman. Box 416, AMERICAN MACHINIST.

Mechanical engineer, resourceful, inventive, accustomed to designing special tools, and up to date in shop practice, open for position May 1. Address Box 8, AMER. MACHINIST.

Mechanical engineer, practical mechanic of long experience, desires a position as superintendent with a reliable manufacturing company. Address Box 69, AMER. MACHINIST.

Technical graduate, with 12 years' practical experience as draftsman and superintendent for shop, desires position as draftsman. Address O., Box 89, AMERICAN MACHINIST.

Wanted—Charge of designing; new firm or branch preferred; college graduate, 19 years on steam and gas engines, compressors, passenger elevators, etc. Box 352, South Norwalk, Conn.

Machinist, tool-maker and designer; successful experience as foreman and general foreman; can furnish A1 references from the most up-to-date concerns in the country. Box 88, AMERICAN MACHINIST.

First-class tool and diemaker, 10 years' experience, typewriter, gun, watch work, desires position; references and highest character from past and present employers. "Connecticut," AMERICAN MACHINIST.

Engineer's License.—Mechanics, engineers, firemen, electricians, etc.; 40-page pamphlet containing questions asked by Examining Board of Engineers sent free. Geo. A. Zeller, Publisher, Room 316, 18 S. 4th st., St. Louis, Mo.

A thorough mechanic wishes position as superintendent or foreman in a large shop; got wide experience in heavy work and marine engines; got executive ability, and capable of handling large force of men. Address C. L., care AMERICAN MACHINIST.

Mechanical engineer is open for engagement; 18 years' experience as superintendent and foreman on small machinery, such as sewing machines, typewriters, electric and sur-

(Continued on next page.)

Manufacturers.

The Atlas Engine Works, Indianapolis, are being enlarged.

The National Aeriform Carbon Company, Chicago, will erect a plant.

The Keystone Driller Company will double its plant at Beaver Falls, Pa.

The Standard Oil Company will, it is said, build a refinery at Somerset, Ky.

Frank High, of Wrightsville, Pa., has perfected plans for a planing mill at Lewisburg.

The American Valve Company has secured a site for its new foundry at West Coxsackie, N. Y.

The National Malleable Castings Company, Cleveland, O., is enlarging its Indianapolis plant.

The Planters' Compress Company is considering the enlargement of its Augusta, Ga., plant.

W. D. Everett, West Milton, O., is in the market for a 25 horse-power engine and boiler.

Ground has been broken at Zanesville, O., for a new chain plant by the American Chain Company.

Work is beginning on a three-story factory for the new American Silver Company, Bristol, Conn.

It is expected that the Whitaker Iron Company, Wheeling, W. Va., will build four new sheet mills.

The Lambert Gas Engine Company, Anderson, Ind., is in the market for a 52-inch engine lathe.

The Moline (Ill.) Plow Co. has certified to an increase in capital stock from $1,600,000 to $2,400,000.

John Dierdorf & Co., piano and organ manufacturers, Indianapolis, Ind., will build a piano factory.

The Hodd & Cullen Milling Company's flour mill and elevator at Stratford, Ont., were burned recently.

The Columbus (O.) Forge & Iron Company is having plans drawn for a new foundry, 50x115 feet.

An addition is to be made to the paper mill of the Esleeck Manufacturing Company, Turner's Falls, Mass.

The new rod mill of Jones & Laughlins, Pittsburgh, Pa., will be ready for operation in about two weeks.

A building permit for a $40,000 factory at Indianapolis has been granted the Bemis Bros. Bag Company.

The mill of the Pantasote Leather Company, Passaic, N. J., manufacturer of leatherette, is to be enlarged.

At Gloversville, N. Y., it is stated that a power-house will be built for the Mountain Lake Electric Railroad.

The factory of the Wallace Barnes Company, manufacturer of clock springs, Bristol, Conn., will be enlarged.

The Columbus (O.) Polishing & Plating Company will erect a new factory, three stories high, 62x75 feet.

The Quincy (Ill.) Novelty & Foundry Co. has certified to an increase in capital stock from $10,000 to $20,000.

The D. F. Brown Company, St. John, N. B., manufacturer of paper and paper boxes, is putting up a new factory.

The glass factory of H. C. Fox & Sons, Schuylkill and Catharine streets, Philadelphia, Pa., is being enlarged.

The plant of the Crystal Plate Ice Company, at Thirty-fifth and K streets, Washington, D. C., is to be enlarged.

The Moseley & Stoddard Manufacturing Company, creamery supplies, Rutland, Vt., is making an addition to its mill.

(*Continued on next page.*)

Situations Wanted—Cont'd.

gical instruments, etc.; draftsman, with technical education, and well posted in modern time and cost systems. Box 60, AM. MACH.

Position as superintendent or manager wanted; have had a large experience in the manufacture of boilers and steam engines, portable and stationary, including compound and single cylinder four valve and high speed engines and water tube, horizontal tubular and other boilers; am familiar with sawmill practice. Address Box 92, AM. MACH.

A manufacturing mechanical engineer of large experience, and who is also a practical inventor, and at the present time superintendent of one of the principal automobile factories in the country, desires an engagement about June 1, 1901; advertiser has designed one of the most successful gasoline automobiles on the market. Address communications to A. M. B., care AMERICAN MACHINIST.

A thoroughly practical machinist and toolmaker, Eastern man, married, 36 years of age, wishes a position where he may obtain experience and training for a superintendent, with a firm making machine tools, automatic machinery or manufactured product of a high class; salary not so much an object as the training; applicant solicits correspondence, which will be treated confidentially. Box 70, AMERICAN MACHINIST.

Wanted—A position by a foreman; can organize and handle men successfully; have best of references; sober, inventive and industrious; understand milling and gear cutting from A to Z, also tool and jig making, and had a number of years practical experience at drawing; would like a position as assistant superintendent or foreman where energy and ability go ahead of talk; age 34. Box 71, AMERICAN MACHINIST.

Help Wanted.

Wanted—Wood pattern makers; steady employment. Address, stating experience, General Electric Co., Schenectady, N. Y.

Wanted—Chemist; one able to do all necessary work in an iron and brass foundry, melting 50 tons per day. Address Box 55, A. M.

Wanted—Two first-class patternmakers on high-speed engine work; state wages expected. The Reeves Machine Co., Trenton, N. J.

Wanted—Two first-class mechanical draftsmen on steam pumps and general machinery; state experience and terms. Box 86, AM. M.

Wanted—Two or three more machinists; give age, experience in full if you are looking for position, and address Box 83, AM. M.

Wanted—Up-to-date cost clerk and factory accountant; state experience, reference, age and salary wanted. Buffalo Forge Company, Buffalo, N. Y.

Wanted—Man competent to take care of the lathe work on printing press cylinders; state age and experience. Address Box 26, AMERICAN MACHINIST.

Wanted—A few bright machinists for assembling and erecting high-speed steam engines; state age and experience. Box 85, AMERICAN MACHINIST.

Wanted—Foreman for modern machine shop employing 40 to 50 machinists; Western man preferred. Address "Progressive," care AMERICAN MACHINIST.

Wanted—First-class designers and draftsmen, experienced in press and die work. Address, stating experience, etc., "Die Press," care AMERICAN MACHINIST.

Wanted—Experienced die and tool maker and designer; capable of cheapening cost of production, metal specialties. The Enterprise Mfg. Co., Akron, Ohio.

Wanted—Foreman for machine shop building slide valve and automatic engines and employing 40 to 50 machinists. Address L. R. R., care AMERICAN MACHINIST.

We invite application for machinists and molders; give references, experience and wages to start; work on steam engines and air compressors. Franklin Air Compressor Co., Franklin, Pa.

Wanted—Mechanical draftsmen with experience. Address, stating age, experience, salary expected and how soon available, John Dalstron, Shoenberger Works, American Steel & Wire Co., Pittsburgh, Pa.

Wanted—Foreman for boiler shop; must be competent, reliable, energetic and familiar with latest methods of construction; state experience; give references. Address L. R. R., care AMERICAN MACHINIST.

Wanted—Competent designer, experienced on machine tool and jig work; state age, length of experience, with what firms previously employed and wages expected. The Bickford Drill & Tool Co., Cincinnati, O.

A Chicago electrical factory needs a first-class metal patternmaker on master parts; only those accustomed to close work and familiar with drawings desired; state age and experience. Box 57, AMERICAN MACHINIST.

Wanted—Two or three toolmakers on light machinery, tools and die work; steady employment to good men; state age, experience and wages expected; location, Central Massachusetts. Address C. M., care AMER. MACH.

We are enlarging our works, and will shortly require an increased number of skilled mechanics; we invite application from pattern makers, molders and machinists. Address the Westinghouse Machine Company, East Pittsburgh, Pa.

Draftsman wanted; bright, quick young man; one who has had some shop practice and experience on engine work preferred; state where and what your experience has been; give references and wages. Box 56, AMERICAN MACHINIST.

Wanted—General shop superintendent; experienced in the manufacture of wood-working machinery; must have energy, ingenuity and executive ability; all communications confidential. Address "Wood Working," care AMERICAN MACHINIST.

Wanted—Lathe foreman, capable of handling 75 men in shop building light and heavy machine tools; must be a hustler and have a thorough knowledge of the business; state reference, age and salary desired. Box 74, AMERICAN MACHINIST.

Wanted—Toolmakers and skilled bench hands; we are adding to our works and would like to correspond with skilled young machinists who are looking for an opportunity to improve themselves; no second raters wanted. Answer, Curtis & Co. Mfg. Co., St. Louis, Mo.

First-class, experienced mechanical draftsmen wanted at once; some of them acquainted with electrical work; those with shop experience preferred. Apply, by letter, to Chief Draftsman, P. O. Box 911, Pittsburgh, Pa., stating experience in full and giving references.

Wanted—25 non-union machinists: 12 lathe men, 6 planer men, 7 vise men, in a Southern shop where 140 men are employed; a city of 20,000 inhabitants and a healthy location; wages from $2.75 to $3 per day; good treatment and steady work guaranteed. Box 76, AMERICAN MACHINIST.

A young man with technical training who has had 3 years' active experience in power-plant work is desired by a large Chicago electrical manufacturing company; a good opening for a capable man; state wages expected, training and experience. Box 84, AMERICAN MACHINIST.

Wanted—One draftsman who is familiar with haulage and hoisting engines and coal-screening machinery, for a shop in Western Pennsylvania; in applying state age, experience in full and wages expected; no fancy price, if you want position. Address Box 82, AMERICAN MACHINIST.

Wanted—Technical graduate, some experience in superintending manufacture of small goods, metal, wood or leather; should be ingenious, mechanical, systematic; first-class position for right man; state age, married or single, experience, references, salary expected. Box 75, AMERICAN MACHINIST.

Wanted—By manufacturing plant (5,000 H. P.) a chief engineer to take entire charge of boilers, engines, dynamos, etc; must be man with sufficient executive ability to handle men and keep entire steam plant in best condition; state age, if married and experience. Box 73, AMERICAN MACHINIST.

Wanted—Transitman with experience around blast furnace and rolling mills; capable of making drawing when not engaged in transit work. Address, stating age, experience, salary expected, and how soon available, John Dahlstrom, Shoenberger Works, American Steel & Wire Co., Pittsburgh, Pa.

A machine tool-building concern near Manchester, England, wants a man with experience in machine tool construction to act as inspector, to inspect the work as it goes through the shop and also the machines when finished; shop is of modern construction and doing high-grade work. Address Box 77, AMERICAN MACHINIST.

Wanted—A man for the position of assistant superintendent in a large works where arc lamps and other small electrical apparatus are manufactured; he must be well acquainted with both mechanical and electrical practice in the manufacture of arc lamps, also an all-around mechanic and familiar with modern shop practice. Box 81, AM. MACH.

Wanted—A first-class mechanical foreman in established works manufacturing hoisting machinery, to take charge of machine work; must understand drawings, the handling of men and use of modern tools and have up-to-date ideas of manufacturing rapidly; state age, experience, salary desired and give reference. Address "Engine Manufacturer," care AMERICAN MACHINIST.